FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

FIT PROJECT

TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY

EXTENT OF SOURCES OF GROUNDWATER
CONTAMINATION - ACME SOLVENTS
PAGEL'S PIT AREA NEAR
MORRISTOWN, ILLINOIS
MARCH, 1983

ecology and environment, inc.

International Specialists in the Environmental Sciences

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1 - INTRODUCTION

1.1 PURPOSE

The purposes of this investigation as tasked by the USEPA in TDD R5-8112-5D (formerly TDD F5-8112-5C) are to determine the source(s) and the lateral and vertical extent of groundwater contamination at the Acme Solvents-Pagel's Pit area near Morristown, Illinois. In order to accomplish this task, background information regarding the site history and geology was gathered. Next, a magnetometer study was initiated to aid in the placement of on site wells. Subsequently, seventeen (17) monitor wells were installed in the study area. These monitor wells, as well as six (6) private wells, were sampled and analyzed for priority pollutant contaminants. This report details the aforementioned tasks as performed by Ecology and Environment Incorporated personnel.

1.2 BACKGROUND INFORMATION

1.2.1 General Study Area

The Acme Solvents-Pagel's Pit study area is located in the extreme southern portion of Winnebago County, Illinois (See Figure 1). The City of Morristown is located approximately one mile northwest of the study area and several private residences are within a one-half mile radius. An intermittent tributary to Killbuck Creek circumvents the southern edge of the Acme Solvent property, Killbuck Creek, a tributary of the Kishwaukee River, is a few hundred yards west of Pagel's Pit and the Kishwaukee River one and one-half miles north.

1.2.2 Acme Solvents

Acme Solvents Reclaiming, Incorporated, purchased 19.97 acres of land with an entrance at approximately 8400 Linderwood Road in August, 1960. Sometime thereafter the firm began reclamation of waste solvents through distillation. Wastes, including paint, oil, solvents and sludges, which could not be reclaimed were disposed of in numerous pits on the property.

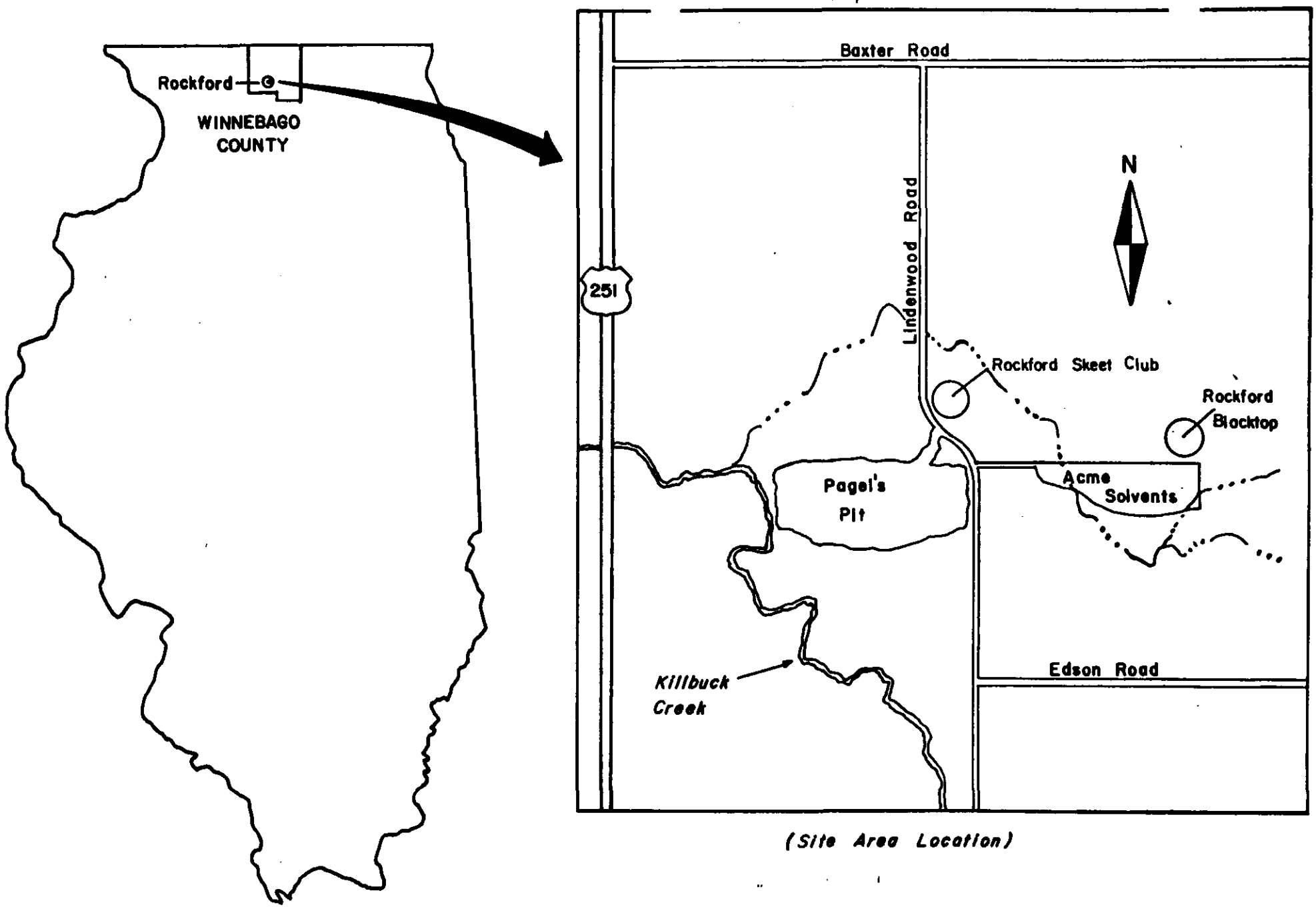

FIGURE 1. Site Location Map for Acme Solvents Reclaiming Inc.

● Not drawn to scale

In 1972, the Illinois Environmental Protection Agency (IEPA) estimated some 10,000 to 15,000 barrels on site.

In September 1972, Acme Solvents admitted guilt to numerous violations charged by the Illinois Pollution Control Board (IPCB) (IPCB order number 72-288). As a result of that action, all barrels were to be removed, wastes were to be pumped from holding ponds, and the ponds were to be dirt filled. The clean-up operation was to be completed by April 2, 1973.

In November 1972, Acme Solvents filed for a Petition of Variance (IPCB order number 72-436). At that time, the IPCB fined Acme Solvents and ordered them to return the site to its original condition.

Follow-up inspections beginning in December 1972, revealed that most barrels were being crushed and buried on site rather than being removed as ordered. It was also noted by inspectors that liquid wastes in disposal ponds were being covered in place. Although further inspections revealed similar conditions, a letter dated April 9, 1973 was issued closing the site.

1.2.3 Pagel's Pit

Pagel's Pit is a sixty (60) acre, asphalt lined sanitary landfill owned by Winnebago Reclamation Service, Incorporated. Although officially licensed in 1972, the site has been in operation since the late 1960s. Records indicate that the types of waste disposed of in Pagel's Pit include organics, inorganics, solvents, heavy metals and mixed municipal refuse. Past problems of methane gas migration to basements in nearby homes and suspected groundwater contamination are attributed to the Pagel's Pit landfill. In response to these problems, the landfill owners have installed a gas venting system and utilize a leachate collection system.

1.2.4 Rockford Blacktop

The Rockford Blacktop facility is located at the northeast corner of the Acme Solvents Inc., property (see Figure 1). Although historic data is not available at this time, the following observations were made by Ecology and Environment personnel at the time of monitor well installation and sampling.

Rockford Blacktop produces asphalt for highway and driveway construction. A quarry located on the property is utilized as a source of sand and gravel which is then mixed with coal tar derivatives to produce the final product. End loaders were observed loading gravel onto a conveyor belt which moved the gravel upward into a mixing tank. Several tanker trucks were noted around the facility which could be utilized for delivery of asphalt. As many as six to ten persons may be employed at the facility. A State of Illinois Department of Transportation (IDOT) inspector verified that asphalt is produced at the facility. The only areas noted as possible groundwater contamination sources were an apparent truck cleaning station and a side slope along the southern property line which had been paved over.

1.2.5 Previous Sampling Programs and Results

In mid-1981, both the IEPA and the Winnebago County Health Department responded to complaints from residents in the study area vicinity by testing drinking water supplies. Findings indicated the presence of numerous organic compounds including 1,2-dichlorethylene, 1,1,2,2,-tetrachloroethylene, 1,1,1-trichloroethane and 1,1,2-trichloroethylene. Concentrations of total volatile organics detected reached as high as 517ppb.

As a result of these tests, several homeowners on Lindenwood Road have been forced to drill new wells and/or use bottle water.

In July 1981, soil and sludge samples were taken on the Acme Solvents property. Results of these soil tests indicate the presence of aliphatic hydrocarbons, toluene, xylene, trichloroethane, trichloroethylene, and other organic compounds on the property.

On August 24, 1982 the IEPA obtained surface water from Killbuck Creek (approximately 200 feet west of Pagel's Pit) and groundwater samples from a hydrant at the Rockford Skeet Club on Lindenwood Road (see Plate 1 for location). The result of tests for volatile organics indicated the presence of total volatiles in the skeet club well as approximately 257ppb and approximately 100ppb in the Killbuck Creek surface water sample.

Both the soil and drinking water sample findings indicate a serious groundwater contamination problem exists in the study area. Determination of the specific source of the groundwater pollution is complicated by the proximity of Acme Solvents to Pagel's Pit. Both businesses are possible contaminant sources. Thus, the purposes of this study, are to determine the source(s) and the lateral and vertical extent of the groundwater contamination.

2 - GEOLOGY AND HYDROGEOLOGY OF WINNEBAGO COUNTY

2.1 INTRODUCTION

Winnebago County is located completely within the glaciated region of northern Illinois. Wisconsin age drift varies from 0 to 200 feet in thickness within the county. These drift sequences are predominantly underlain by Ordovician Age bedrock deposits which in turn rest upon Cambrian age strata. Eight (8) wells in northern Illinois have reached Precambrian crystalline rock (Hackett 1960). A notable review of both glacial and bedrock aquifer systems in Winnebago County is currently available by Berg et.al (1981). Table 1, which has been adapted from Hackett (1960) and Willman et.al (1975), provides a generalized stratigraphic section with aquifer properties found in Winnebago County.

2.2 PRECAMBRIAN ROCK

Basement rock of Precambrian age has been penetrated at depths ranging from 1900 feet to 3000 feet below the land surface in northern Illinois. The rock was found to be red to gray, medium to coarse crystalline granite. The low porosity of the Precambrian crystalline rock precludes this strata as a viable water source.

2.3 CAMBRIAN ROCK

2.3.1 Introduction

Water bearing bedrock formations found within the Cambrian system in Winnebago County include the Mt. Simon Sandstone, the basal unit of the Eau Claire Formation, and the Ironton-Galesville Sandstone. These bedrock aquifers are used principally by large capacity (up to 2,000 gallons/minute) industrial wells.

2.3.2 Mt. Simon Sandstone

The Mt. Simon Sandstone, within the county, varies in thickness from 800 feet to 1600 feet. It is described as oxidized red at the base and yellowish gray to pink in the upper portion. Grains are very fine to very coarse with variable sorting.

TABLE 1

STRATIGRAPHY AND GEOHYDROLOGIC USAGE OF BEDROCK AND GLACIAL UNITS IN WINNEBAGO COUNTY

SYSTEM	MEGA-GROUP	GROUP	SUB-GROUP	FORMATION	USAGE OF GEOHYDROLOGIC UNIT		
QUATERNARY					GLACIAL DRIFT AQUIFER		Probabilities of ground water development are poor to excellent depending upon thickness of glacial deposits and grain size.
ORDOVICIAN	OTTAWA	GALENA	KIMMSWICK	DUBUQUE	BEDROCK AQUIFERS	ORDOVICIAN AQUIFERS	DOLOMITE AQUIFERS Principle source of water supply for various types of wells. Most wells finished 20 to 100 feet into dolomite. Average yields of 20 gallons per minute. Aquifers susceptible to pollution particularly in areas where glacial drift is less than 50 feet.
				WISE LAKE			
				DUNLEITH			
			DECORAH	GUTTENBERG			
		PLATTEVILLE		SPECHTS FERRY			SANDSTONE AQUIFERS Sandstone beds from basal unit of Glenwood formation downward yield water supplies up to 300 gpm. This widely used aquifer's yield depends upon sandstone bed thickness.
			PLATIN	QUIMBYS MILL			
				NACHUSA			
				GRAND DETOUR			
				MIFFLIN			
		ANCELL		PECATONICA			
				GLENWOOD			
				ST. PETER			

*Complied from Hackett, 1960 and Willman et. al 1975.

TABLE 1 (Continued)

STRATIGRAPHY AND GEOHYDROLOGIC USAGE OF BEDROCK

AND GLACIAL UNITS IN WINNEBAGO COUNTY

SYSTEM	MEGA-GROUP	GROUP	SUB-GROUP	FORMATION	USAGE OF GEOHYDROLOGIC UNIT	
	KNOX DOL.			JORDAN Ss	CAMBRIAN AQUIFERS	Permeability is low in this zone due to a large proportion of shale. Groundwater development potential is poor.
				EMINENCE		
				POSTOSI DOL.		
CAMBRIAN	POTOSI DOL.			FRANCONIA	CAMBRIAN AQUIFERS	SANDSTONE AQUIFER These principal sandstone aquifers are used for large capacity (up to 2000 gpm) industrial wells.
				IRONTON		
				GALESVILLE		
				EAU CLAIRE		
	STONE			MT. SIMON		

*Compiled from Hackett, 1960 and Willman et.al 1975.

2.3.3 Eau Claire Formation

The upper portions of the Eau Claire Formation are not considered a good water source due to a high shale content. The basal zone of this formation which is used as a water source, is a light yellow to gray, very fine to very coarse grained sandstone with a few beds of shale and siltstone.

2.3.4 Ironton-Galesville Sandstone

The Ironton-Galesville Sandstone varies in thickness from 75 to 170 feet within Winnebago County. This mostly white, fine to coarse-grained sandstone varies in permeability and water yield due to variations in character and lithology.

2.4 ORDOVICIAN ROCK

2.4.1 Introduction

Ordovician age rock is the source of two (2) principal aquifers in northern Illinois. The upper aquifer is the dolomitic units of the Galena-Platteville groups which provide water to more wells than any other aquifer in Winnebago county (Berg et.al 1981). The deeper sandstone aquifer wells are finished in the Glenwood Formation or the St. Peter Sandstone. These sandstone units yield up to 300 gallons per minute.

2.4.2 St. Peter Sandstone

The St. Peter Sandstone is a fine to medium grained sandstone with local zones of silty and argillaceous material. The unit varies in thickness from 200 feet to 360 feet. Water bearing characteristics vary depending upon the amount of fine grained material present.

2.4.3 Glenwood Formation

The Glenwood Formation is composed of interbedded shales, dolomites, and sandstone. The unit varies in thickness from 0 to 60 feet. The lower coarse-grained silty sandstone beds are an excellent water source. The presence of shale in the upper portion makes that zone of little water bearing significance.

2.4.4 Galena-Platteville Groups

The dolomitic units of the Galena-Platteville Groups are the principal water source within Winnebago county. The Galena Dolomite is yellowish gray to buff or brown, mostly medium to coarsely crystalline, and varies in thickness from 0 to 180 feet. The associated Platteville dolomite varies from 95 feet to 135 feet thick. It is light gray to brown and generally finely crystalline. An Illinois Geological Survey Report tells of average yields in the Galena-Platteville dolomite of 20 gallons per minute. However, this report cautions "that these aquifers are very sensitive to contamination because water moves through relatively open channels (joints and fractures) and there is little filtering action.... Therefore, where the drift cover is relatively thin, the potential for contamination is high" (Berg et.al 1981).

2.5 PLEISTOCENE SYSTEM

Several ice advances occurred within Winnebago county during the Pleistocene age. Varying conditions and thickness of drift throughout the county account for glacial drift acquifer systems whose water production varies in condition from poor to excellent.

3 - GEOPHYSICAL WORK

3.1 INTRODUCTION

Prior to the commencement of monitor well installation, a magnetometer survey was conducted at the Acme Solvents facility by Ecology and Environment personnel. The purpose of the investigation was to detect the extent of buried ferromagnetic articles (buried drums) and to aid in the placement of monitor wells. The magnetometer can provide data on magnetic anomalies over a site. From this data, the presence, concentration and distribution of buried iron (drums) may be inferred.

3.2 METHODS

On March 25 and 26, 1982, a proton magnetometer (Model G-846) survey was conducted. Resolution of one gamma was obtained when possible. However, when extremely high magnetic gradients were encountered, a resolution of one hundred gamma was recorded. One count stability was obtained in low magnetic gradient areas. In areas of highly magnetic flux, several (5 to 6) measurements were taken at each station. The average of these readings were recorded to the nearest 100 gammas. In this manner, some of the noise was averaged out.

A total of 24 lines (number 1 through 24) were set-up with a 50-foot spacing between the lines. Stations (A through H) at 50-foot intervals along each line were placed in order to produce a grid pattern. Additional readings were taken at 25-foot increments between the grid stations when high magnetic gradients were encountered.

Magnetic anomalies were interpreted as areas containing steel drums. This interpretation is supported by the fact that some areas of high magnetic anomalies were associated with observed partially exposed drums. The extent of buried drums is shown in Figure 2. In addition to aiding in the placement of monitor wells, Figure 2 will also be helpful for future remedial action.

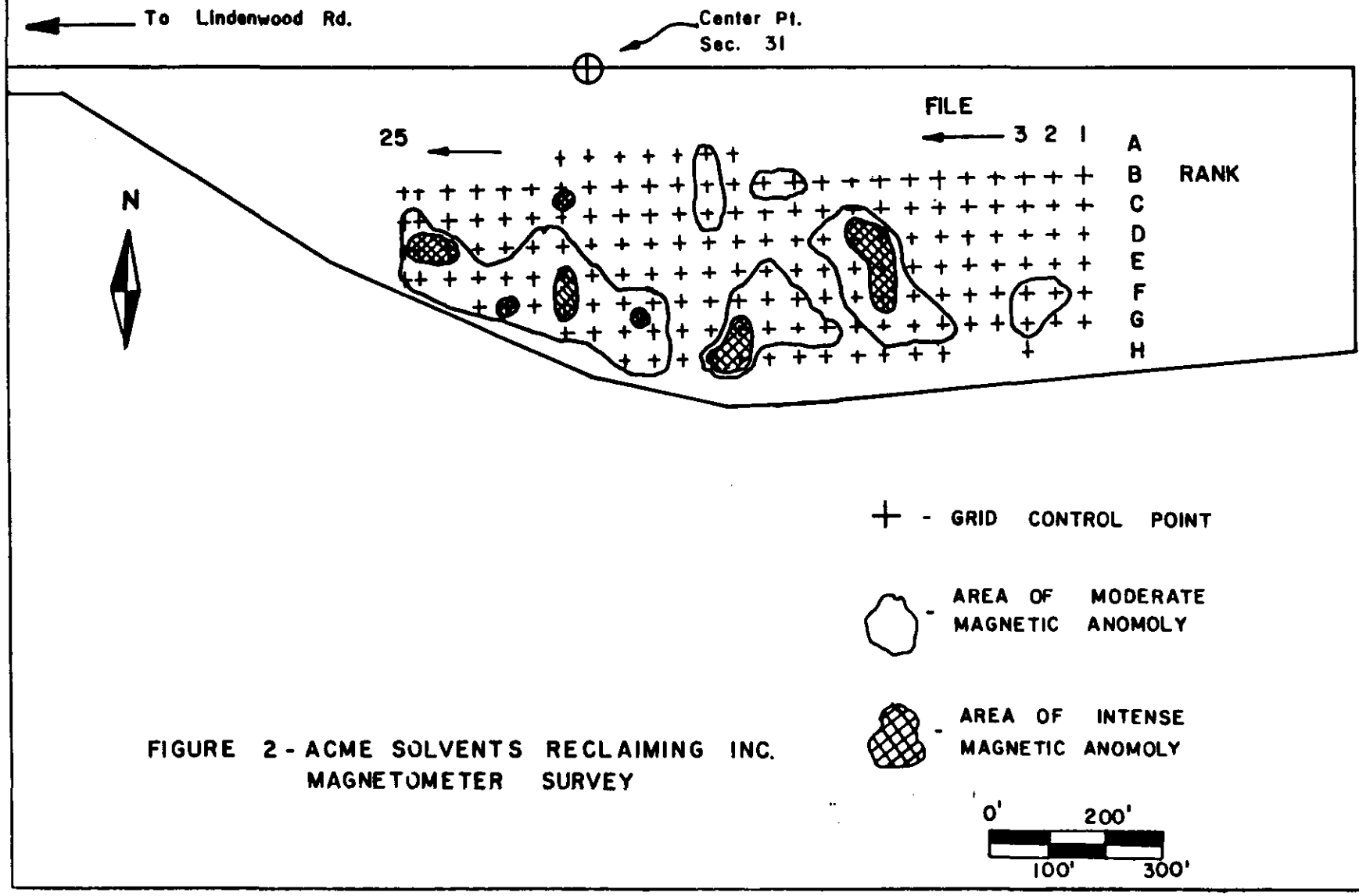

FIGURE 2 - ACME SOLVENTS RECLAIMING INC.
MAGNETOMETER SURVEY

4 - BORING/WELL INSTALLATION

4.1 INTRODUCTION

During the period September 13, to October 8, 1982, seventeen (17) wells were installed in the Acme Solvents-Pagel's Pit study area. All phases of well installation were accomplished by Warzyn Engineering, Incorporated of Madison, Wisconsin under the supervision of Ecology and Environment, Incorporated personnel. Well locations are shown on Plate 1.

4.2 METHODS

4.2.1 Drilling

Each boring was advanced using a CME-55 truck mounted rig. Overburden drilling utilized 3 1/4-inch inner diameter (I.D.) hollow stem augers. Sampling was done with a 2-inch outer diameter (O.D.) split spoon sampler. Drilling methods and penetration tests were performed in accordance with current A.S.T.M. D-1452-65 and D-1586-67 procedures, respectively. Borings which required bedrock drilling utilized a tri-cone roller bit with air. Rock core sampling was performed at six (6) locations by the use of a NQ coring barrel with a NQ diamond bit and air as the drilling fluid. Boring B-6D utilized clean potable water as the drilling fluid.

4.2.2 Decontamination

The drill rig and accessories were steam cleaned prior to the commencement of work on the project. The augers and cutting bit were decontaminated between borings with a water wash, then rinsed with acetone, and allowed to air dry. Split spoon samplers were decontaminated between samples with a clean water wash, an acetone rinse, and then air dried.

4.2.3 Well Construction

Groundwater monitoring wells consisted of two (2) inch I.D., five (5) foot length, galvanized steel well points with a slot size of 0.010 inches and two (2) inch I.D. galvanized flush-jointed pipe. The well points and pipe were washed with acetone prior to installation. A vented cap was installed on each well. Each well point was surrounded with natural sand and/or

clean silica sand. A bentonite seal was emplaced above the sand. The remainder of the annulus was backfilled with cement grout. A locked steel casing was set in concrete around the inner casing for protection. Figure 3 depicts a typical monitor well contruction.

4.3 WELL LOCATIONS

Well locations are shown on Plate 1. Individual wells were located to provide information regarding contaminant source(s) and the lateral extent of contamination. Well B-6D was drilled to a depth of one hundred (100) feet to provide first phase information on the vertical extent of groundwater contamination and vertical flow characteristics of the bedrock aquifer. Boring logs and individual well design information are contained in the Appendix. An arbitrary datum of 200.00 feet for the top of the inside casing at B-12 was used for all elevations.

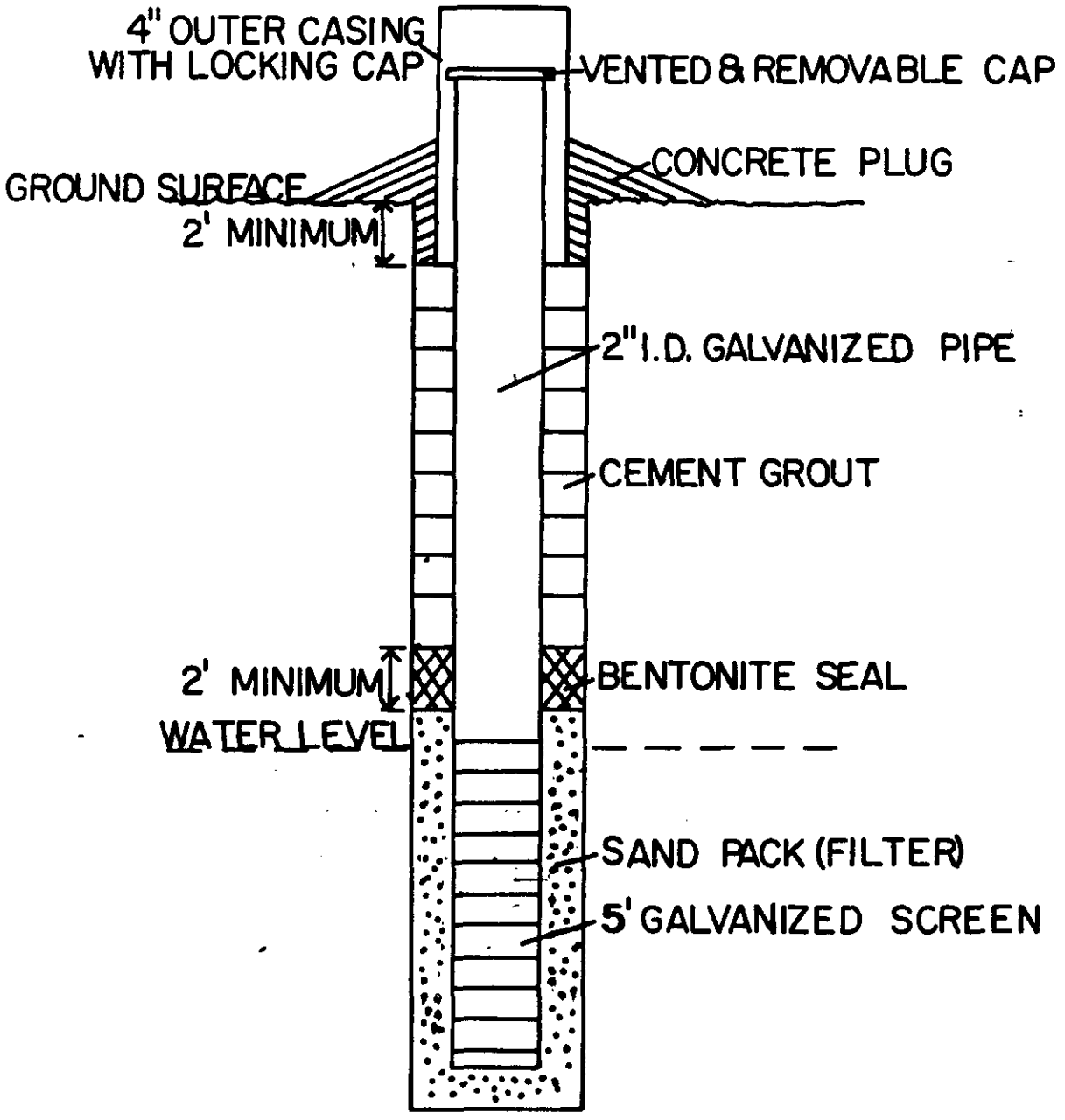

FIGURE 3 - TYPICAL WELL CONSTRUCTION

5 - SITE CHARACTERISTICS

5.1 SOILS

5.1.1 Introduction

Soils in the study area can be classified into two (2) predominant soil associations. Soil associations are groups of soils which form repeating geographic patterns throughout the area. Soil associations found in the Acme Solvents-Pagel's Pit study area are the Flagler-Warsaw-Hononegah Association and the Comfrey-Selma Association.

Plate 2 depicts the surficial distribution of individual soil series found in the study area. Table 2, lists each soil series designation, name, description, drainage characteristics and slope.

5.1.2 Flagler-Warsaw-Hononegah Association

The Flagler-Warsaw-Hononegah Association is characterized as deep, well-drained soils that formed in loamy and sandy sediments underlain by sandy and gravelly sediment on high stream terraces (SCS 1980). In addition to the three (3) major soils, minor units of Rodman soil are found in the area. Rodman soils are formed on kames in the study area and are characterized by excessive drainage.

5.1.3 Comfrey-Selma Association

The Comfrey-Selma Association includes deep, poorly drained, nearly level soils that formed in recent alluvium or in outwash sediment on flood plains or low stream terraces (SCS 1980). Millington soils are also found with this association.

5.2 GEOLOGY

5.2.1 Introduction

The stratigraphy of the study area is based upon the seventeen (17) borings from this study and four (4) boring logs of work performed by the Illinois Environmental Protection Agency (IEPA) in 1981. The overburden sequence consists of four (4) basic units with several variations. The encountered bedrock is composed of Galena-Platteville dolomites and limestones.

TABLE 2
SOILS IN THE ACME SOLVENTS/PAGEL'S PIT STUDY AREA

SOIL UNIT DESIGNATION	SERIES NAME	DESCRIPTION	DRAINAGE	SLOPE
82	Millington	Deep, moderately permeable formed in stratified alluvium derived from loess and calcareous glacial drift.	Poor	0-2%
125	Selma	Deep soils formed in loamy, water-laid deposits.	Poor	0-2%
146	Elliott	Deep loamy soils formed in loess and underlying silty clay loam glacial till.	Somewhat Poor	0-3%
223B	Varna	Deep soils formed in loess and the underlying silty clay loam glacial till.	Moderately Well	2-6%
290B & 290C2	Warsaw	Deep soils formed in loamy outwash overlying calcareous sand and gravel - found on sideslopes of kames and eskers.	Well	2-5% & 5-9%
293	Andres	Deep soils formed in loess and the underlying calcareous silty clay loam glacial till.	Somewhat Poor	0-3%
343	Kane	Silty and loamy sediment over calcareous sand and gravel	Poor	Nearly Level
354A & 354B	Hononegah	Deep, very rapidly permeable soil formed in sandy deposits and underlying calcareous sand and gravel.	Excessive	0-3% & 3-7%

TABLE 2 (Continued)

SOILS IN THE ACME SOLVENTS/PAGEL'S PIT STUDY AREA

SOIL UNIT DESIGNATION	SERIES NAME	DESCRIPTION	DRAINAGE	SLOPE
504C	Sogn	Shallow, moderately permeable soils formed in residum of dolomite.	Somewhat	4-12%
728B & 728D2	Winnebago	Deep, moderately permeable soils formed in a thin mantle of loess and the underlying reddish paleosol that formed in sandy loam glacial drift.	Well	2-5% & 9-15%
768B	Backbone	Moderately deep, well drained soils that formed in sand and the underlying glacial drift. Depth to bedrock is 20" to 40".	Well	2-5%
776	Comfrey	Deep soils formed in alluvium	Poor	0-2%
783B	Flagler	Deep soils formed in moderately coarse textured alluvial sediment and the underlying deposits of loamy sand or gravelly sand.	Somewhat Excessive	3-7%
802	Orthents			
864	Pit	Limestone quarry		
865	Pit	Gravel		
939D2 & 939E2	Rodman	Shallow soils to calcareous sands and gravel formed on kames, eskers and terrace breaks	Excessive	7-12% & 12-30%

5.2.2 Geologic Cross Sections

From the cross sections shown on Plate 3 (see Plate 1 for locations of cross sections), the encountered geologic materials are comprised, generally, in the following sequence. The first unit is composed of a thin layer of black silt top soil with a trace of sand which is underlain by dark brown, very fine sandy silt to silty clay. The thickness of this horizon varies from one (1) to four (4) feet. The second unit is comprised of brown, silty, fine sand to dark brown, clayey, fine sand. This unit, when present, is one to 18 feet thick. It is present in 9 of the 16 boring locations. The third unit is a light brown to gray, silty clay till. This till is located in borings 3, 5, 8, 9, 12 and 13. These borings are located within the southern portion of the study area. The thickness of this unit varies between 1.5 to at least 33 feet. This unit has been classified as the Esmond Till Member of the Wedron Formation of the Wisconsin Age. The fourth and final overburden unit is a light brown to tan, fine to coarse sand with gravel. This unit is present in ten (10) borings and varies in thickness from 4.5 to 24.5 feet.

Bedrock was encountered at 11 of the 16 locations and core samples were obtained at seven (7) locations. It was observed that bedrock, which had sandy material overlying it, was generally of poor quality and usually unsuitable for coring. Conversely, areas of bedrock with overlying clay materials were of much higher quality. The cored bedrock, based primarily on boring 6D, is comprised of gray, calcareous dolomite with vugs, white chert, and a few fossils; gray, vuggy, calcareous dolomite with white and blue gray chert and brownish green shale partings; gray, dolomitic limestone with brownish green shale partings and vugs; and light gray, calcareous dolomite, with vugs and gray shale partings. Cored bedrock was highly weathered with fractures ranging from horizontal to vertical. The bedrock is apparently from the Galena Group which is underlain by the Platteville Group. See well logs (appendix) for complete bedrock description.

Several significant variations of the aforementioned sequence of glacial materials are worthy of comment. In boring 1, a tan to gray, clayey silt was encountered above the weathered bedrock. Boring 3 contains several lenses of moist to wet, light brown, fine sand interbedded with the Esmond Till Member clays. Boring 5 contains a wet, light brown, silty, clayey, fine sand lens within the Esmond Till Member clay. Boring 14 contains one (1) foot of brown, fine sand and gravel at the surface which is underlain by 6.5 feet of black clayey silt and silty clay.

Dolomitic bedrock outcrops are visible on the southwest part of the Acme Solvents site. Bedrock can also be observed north of the mounded earth on the Acme Solvents property. Apparently, the thin soil cover was scraped-off the bedrock and used to cover the former lagoons and create the present mounds.

The presence of buried bedrock valleys is substantiated by the absence of bedrock in borings 3, 5 and 8 in the southern part of the study area and in borings 14 and 15 in the western portion of the study area. The cross section B-B1 in Plate 3 clearly shows the buried bedrock valley at the southern edge of the study area. The valley to the south is apparently a tributary to the valley on the west. These valleys can be seen graphically in Hackett's (1960) report on Winnebago county.

5.3 HYDROGEOLOGY

5.3.1 Shallow Aquifer System

The upper portion of the shallow aquifer in the area is located within light brown to tan, fine to coarse sand with gravel, and dolomitic bedrock. The majority of the aquifer appears to be contained within the dolomitic bedrock (Galena) and is under at least semi-confined conditions. As evidenced by Plate 3 and groundwater and surface water elevations taken on October 25, 1982, no apparent hydraulic connection is present between the surface tributary which circumvents the southern edge of the Acme Solvents property and the groundwater aquifer.

5.3.2 Potentiometric Surface

Potentiometric surface maps (Plates 4A and 4B) of the aquifer were prepared utilizing water level measurements taken on October 25, 1982 and November 24, 1982, respectively (see Table 3). It should be noted that water elevations at B-3 are not consistent with aquifer conditions. Well B-3 is apparently located within a perched groundwater zone or a water bearing lens on the side of the buried bedrock valley. This zone appears to be isolated from the underlying bedrock by the low permeability of the Esmond Till clay layer. This condition produces water levels which are significantly higher than adjoining wells.

Water levels obtained on October 25, 1982 are indicative of relatively dry hydrologic conditions. Plate 4A indicates that the flow direction in the upper portion of the aquifer is westerly. The calculated hydraulic gradient varies between 0.0067 and 0.0125 (see Plate 4A Cross-Sections W-W and X-X for locations).

The November 24, 1982 water levels were obtained during a wet hydrologic period. Plate 4B indicates that the flow direction in the upper portion of the aquifer is south - southwest. The calculated hydraulic gradient varies betwen 0.0044 and 0.0016 (see Plate 4B Cross-Sections Y-Y and Z-Z for locations). This southwest shift in the upper portion of the shallow aquifer's flow direction may explain the apparently erratic presence of contamination in the McClellan (8800 Lindenwood Road) well. Instead of flowing exclusively to the west toward the Lyford (8630 Lindenwood Road) and Baxter (8554 Lindenwood Road) wells, a portion of the contaminated water flows more southwesterly toward the McClellan well. The amount and duration of hydrologic event(s) needed to produce this effect were not determined.

5.3.3 Vertical Gradient

Water levels obtained from wells 6S and 6D were used in determining the vertical gradient (dh/dl) within the dolomitic bedrock aquifer. Using the distance of 51.98 feet between the well points for dl and the difference in water level elevations for dh, the vertical gradient was determined.

TABLE 3
GROUNDWATER ELEVATIONS FOR
ACME SOLVENTS/PAGEL'S PIT STUDY AREA

WELL DESIGNATION	WATER LEVEL (a) OCTOBER 25, 1982 (SEE PLATE 4A	WATER LEVEL (a) NOVEMBER 24, 1982 (SEE PLATE 4B)
B-1	169.22	170.11
B-2	168.86	169.72
B-3 (b)	178.20	179.37
B-4	168.22	171.79
B-5	165.00	166.48
B-6S	165.76	170.68
B-6D (c)	162.29	165.78
B-7	168.43	173.90
B-8	159.90	161.09
B-9	160.02	161.49
B-10	151.80	152.34
B-11	157.56	158.66
B-12	158.13	159.97
B-13	153.66	153.42
B-14	150.99	151.59
B-15	147.14	147.63
B-16	162.56	167.11
State Well G101	165.68	168.20
State Well G102	152.78	154.40
Abandoned Shack	170.76	171.00

(a) All elevations relative to top of inside casing of well B-12 = 200.00 feet.

(b) Well B-3 not used for piezometric surface maps as it is located in different aquifer.

(c) Well B-6D not used for piezometric surface due to extreme depth (100.00 feet).

The vertical gradient on October 25, 1982 was -0.067. On November 24, 1982, the vertical gradient was -0.094. On each date, a significant downward gradient within the dolomitic bedrock was measured. This suggests a mechanism for contaminant movement down into the dolomitic bedrock aquifer.

5.3.4 Flow Velocities

The hydraulic conductivity for the aquifer was not determined. In order to determine the aquifer's hydraulic conductivity, a pump test would need to be performed. This would allow for the prediction of groundwater flow velocity. However, for the purposes of this study, it should be sufficient to state that groundwater flow within the cracks and fractures of the dolomitic bedrock should be rapid. The sloping hydraulic gradient along with high hydraulic conductivity in the dolomitic bedrock aquifer should provide groundwater flow rates which would enable contaminants from Acme Solvents to reach private wells approximately one-fourth mile west of the site within the limited time frame.

5.3.5 Mounding

The potential mounding of liquids within the Pagel's Pit could at least locally, affect the groundwater flow. However, from Plates 4A and 4B, there is no evidence of groundwater flow rate(s) and/or direction(s) being affected by the landfill. This may be attributable to the map scale which may be too large to detect the affects. Distances between wells close to the landfill are apparently too great for detection of the mounding phenomenon.

6 - SAMPLING PROCEDURES AND ANALYSES

6.1 SURFACE WATER SAMPLING

Two surface water samples were taken by Ecology and Environment personnel in March, 1982. The intermittent stream which circumvents the southern boundary of the Acme Solvents property (see Plate 1) was sampled at two (2) locations. An upstream sample was obtained at the junction of two (2) tributaries near the southeast corner of the Acme Solvents property. The downstream sample was taken at the point where the stream crosses the southern boundary of the Acme Solvents property approximately 100 feet east of well B-7. Upon completion of sampling each sample was properly preserved and shipped to Versar Laboratory, Springfield, Virginia for analysis of organic priority pollutants. Analytical results revealed the presence of no organic pollutants at the time of sampling.

Surface water tests of a stream bank spring which enters Killbuck creek approximately 200 feet west of Pagel's Pit were conducted August 24, 1982 by the Illinois Environmental Protection Agency. Test results indicate that numerous volatile organics are entering Killbuck creek from a shallow groundwater source to the east. Test results have not been included in this report as they were not collected by Ecology and Environment.

6.2 GROUNDWATER SAMPLING

6.2.1 Introduction

On October 25 through October 29, 1982 and November 1, 1982, groundwater sampling was conducted at the Acme Solvents/Pagel's Pit study area by Ecology and Environment personnel. In addition to the 17 monitor wells installed for the study, six (6) private wells were sampled. The private wells chosen for sampling consisted of those wells previously found contaminated by County and State officials (see Section 1.5). All groundwater sample points are depicted on Plate 1.

2.2 Procedures

6.2.2.1 Private Wells

The six (6) private wells on Lindenwood Road (8800, 8630, 8811, 8635, 8554 and Scale House well) were sampled on October 25, 1982. None of the sampled wells utilized a water softening device which could interfer with laboratory results. Prior to sampling, tap aeration devices were removed and water was allowed to run a minimum of 10 minutes to remove any stagnant water from within the system.

6.2.2.2 Monitor Wells

The 17 groundwater monitor wells were sampled over the period October 25, 1982 to November 1, 1982. Prior to sampling, each well was developed to remove any construction debris. Well development consisted of removing a minimum of ten (10) volumes of water from each well. An additional two (2) volumes of water were bailed from each well immediately prior to sampling to assure a representative sample. Table 4 lists the gallons of water removed from each of the monitor wells.

Sampling of each well was accomplished with stainless steel bailers. Prior to sampling, bailers were decontaminated with a distilled water wash followed by an acetone wash, a distilled water rinse and air drying. A new 3/16-inch diameter nylon rope was used for each well in order to prevent the possibility of cross-contamination between wells. Each well sample was prepared for shipment to USEPA contract laboratories for analysis of organic and inorganic priority pollutants. Organic samples were preserved by icing them to maintain a maximum temperature of 4°C. Inorganic samples were analyzed for both metals and cyanides. Those samples to be analyzed for metals were field-filtered with a 0.45 micron filter to remove suspended solids prior to preservation. Nitric acid was used to reduce the sample pH to below 2. Those samples to be analyzed for cyanide were preserved by the addition of sodium hydroxide which raised the sample pH to 12.

TABLE - 4 VOLUME OF WATER REMOVED FROM MONITOR WELLS
ACME SOLVENTS/PAGE'S PIT

MONITOR WELLS DESIGNATION	GALLONS REMOVED FOR DEVELOPMENT (10/20/82-10/21/82)	GALLONS REMOVED PRIOR TO SAMPLING (10/25/82-11/1/82)
B-1	10.0	2.0
B-2	22.0	4.5
B-3	60.0	12.0
B-4	15.0	3.0
B-5	15.0	3.0
B-6S	40.0	10.0
B-6D	120.0	24.0
B-7	18.0	4.0
B-8	14.0	3.0
B-9	12.0	2.5
B-10	18.0	4.0
B-11	14.0	3.0
B-12	16.0	3.5
B-13	17.0	4.0
B-14	12.0	2.5
B-15	10.0	2.0
B-16	10.0	2.0

To assure legal chain-of-custody, each shipping container was sealed with USEPA custody seals. All seals were reported as being intact upon receipt at the laboratory.

6.2.3 Laboratory Analysis

6.2.3.1 Introduction

Upon completion of laboratory analysis for priority pollutants, each data set was reviewed for quality assurance by contract laboratory personnel as well as the United States Environmental Protection Agency and Ecology and Environment, Incorporated. The data reported herein have been determined as acceptable for use by the aforementioned.

6.2.3.2 Inorganic Results

Results of laboratory inorganic analysis are shown in Table 5. High concentrations of zinc in the monitor wells are probably due to use of galvanized well materials. This supposition is supported by low zinc concentrations in the six private wells. The presence of chromium and cadmium may also be attributable to well materials. Most notable of the inorganics found are barium (wells B-4, B-12, B-13, B-15 and 4 of 6 private wells), and arsenic in well B-15.

6.2.3.3 Organic Results

The results of laboratory analyses of organic priority pollutants and tentatively identified compounds are reported in Tables 6, 7, 8 and 9. Findings are reported as concentrations in parts per billion with the exception of the tentatively identified compounds which are reported as being present.

Only those tentatively identified compounds of purities exceeding 90% are listed. The tentatively identified compound 2-pentanone, 4-hydroxy-4-methyl, which is present in many of the samples, has been flagged by laboratory quality assurance as a possible laboratory contaminant. Compounds have been grouped into categories of acid, base-neutral and volatile fractions of organic priority pollutants, and the aforementioned tentatively identified compounds.

Groundwater samples contained a total of twenty-nine acid and/or base-neutral organic contaminants. Of these, many are coal tar by-products which are commonly used in the process of making asphalt (NIOSH, 1977). Those by-products detected which are derived from coal and tar include the cresol and phenol groups, acenaphthene, napthalene, pyrene, phenanthrene, dibezo (a,h) anthracene, fluorene, chrysene and benzo (b) fluoranthene as well as others. The majority of these contaminants were detected in well B-2, adjacent to the Rockford Blacktop facility, and well B-11 adjacent to the asphalt-lined Pagel's Pit Landfill.

Nearly twenty volatile organic priority pollutants were detected in the groundwater samples. Wells B-7, B-9, and B-14, and the Palmer well (8811 Lindenwood) Road) were the only wells found to not contain organic volatiles. All other monitor wells except B-3 (1 volatile) contain relatively high levels of organics. A mechanism which exists for releasing volatile organics to the groundwater is the occurence of precipitation events in which water percolates through the porous overburden on the Acme Solvent property, through the buried wastes, through into the fractured and weathered bedrock, and on into the groundwater. These findings are discussed further in Section 7.

TABLE 5 - INORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

	WELLS														
Pollutant	B-1	B-2	B-3	B-4	B-4 Dup.	B-5	B-6S	B-6D	B-6D Dup.	B-7	B-8	B-9	B-10	B-11	B-12
Antimony															
Arsenic															
Beryllium															
Cadmium		4	2		2	2		1.2	1.3			2	1.2		
Chromium								17	14				11		
Copper															
Lead	8			10				16	13		10				19
Mercury															
Nickel															
Selenium															
Silver								13	16						
Thallium															
Zinc	5200	2300	1180	9900	10100	2520	9240	8790	8330	4680	9710	4200	10690	14200	30400
Barium*				1320	1400										161

*Non-Priority

TABLE 5 - INORGANIC PRIORITY POLLUTANTS (Continued)
(Concentration - PPB)

	WELLS									
Pollutant	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
Antimony										
Arsenic			30							
Beryllium										
Cadmium			17							
Chromium										
Copper										
Lead										
Mercury										
Nickel										
Selenium										
Silver										
Thallium										
Zinc	6990	1450	10400	5400	92	143	142	61	81	36
Barium*	145		1200			121	110	117	178	

*Non-Priority

TABLE - 6 RESULTS FROM ANALYSES OF ACID AND
BASE NEUTRAL FRACTIONS FOR ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

Identified Organic Compound	WELLS													
	B-1	B-2	B-3	B-4	B-4 Dup.	B-5	B-6S	B-6D	B-6D Dup.	B-7	B-8	B-9	B-10	B-11	B-12
ACIDS															
P-Chloro-m-cresol														100	
2-Chlorophenol														94	
2,4 Dichlorophenol														94	
2,4 Dimethylphenol														58	
2,4 Dinitrophenol														340	
Pentachlorophenol	<40													82	
Phenol														36	
BASE NEUTRALS															
Acenaphthene		98												120	
1,2,4 Trichlorobenzene		110												110	
Bis(2-Chloroethyl) ether														24	
1,4 Dichlorobenzene		90												116	
2,4 Dinitrotoluene		110												130	
Bis-(2-Chloroethoxy) methane		92												110	
Hexachlorbutadiene		100												110	
Napthalene		110												130	
N-nitrosodi-n-propylamine		480												500	
Bis(2-ethylhexyl) phthalate		<20							48		<20		22		
Di-n-butyl phthalate		80												110	

TABLE - 6 RESULTS FROM ANALYSES OF ACID AND
BASE NEUTRAL FRACTIONS FOR ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

(Continued)

Identified Organic Compound	WELLS									
	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
ACIDS										
P-Chloro-m-cresol										
2-Chlorophenol										
2,4 Dichlorophenol										
2,4 Dimethylphenol										
2,4 Dinitrophenol										
Pentachlorophenol										
Phenol										
BASE NEUTRALS										
Acenaphthene										
1,2,4 Trichlorobenzene										
Bis(2-Chloroethyl) ether			<10							
1,4 Dichlorobenzene										
2,4 Dinitrotoluene										
Bis-(2-Chloroethoxy) methane										
Hexachlorbutadiene										
Napthalene										
N-nitrosodi-n-propylamine										
Bis(2-ethylhexyl) phthalate										
Di-n-butyl phthalate						<20	<20			

TABLE - 6 RESULTS FROM ANALYSES OF ACID AND
BASE NEUTRAL FRACTIONS FOR ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

(Continued)

Identified Organic Compound	WELLS													
	B-1	B-2	B-3	B-4	B-4 Dup.	B-5	B-6S	B-6D	B-6D Dup.	B-7	B-8	B-9	B-10	B-11	B-12
Di-n-octyl phthalate		96												140	
Diethyl phthalate		54												62	<20
Dimethyl phthalate		<20												20	
Benzo (a) pyrene		96												90	
Benzo (b) fluoranthene		120												160	
Chrysene		100												120	
Acenaphthylene		130												170	
Fluorene		94												120	
Phenanthrene		100												120	
Dibenzo (a,h) anthracene		110												86	
Pyrene		88												150	

TABLE - 6 RESULTS FROM ANALYSES OF ACID AND
BASE NEUTRAL FRACTIONS FOR ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

(Continued)

Identified Organic Compound	WELLS									
	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
Di-n-octyl phthalate			<10							
Diethyl phthalate										
Dimethyl phthalate										
Benzo (a) pyrene										
Benzo (b) fluoranthene										
Chrysene										
Acenaphthylene										
Fluorene										
Phenanthrene										
Dibenzo (a,h) anthracene										
Pyrene										

TABLE - 7 RESULTS FROM THE ANALYSES OF
THE VOLATILE FRACTION OF ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

WELLS

Identified Organic Compound	B-1	B-2	B-3	B-4	B-4 Dup.	B-5	B-6S	B-6D	B-6D Dup.	B-7	B-8	B-9	B-10	B-11	B-12
Volatiles															
Benzene				<5	<5			22					7	<5	19
Carbon Tetrachloride		<5													
1,2 Dichloroethane	<5			11	9.3										6
1,1,1 Trichloroethane	64	28		600	560	<5							<5		
1,1 Dichloroethane	7.2	<5		190	160	<5							<5		83
1,1,2 Trichloroethane				7.2	6.2										
Chlorobenzene															
Chloroethane					<5										
Chloroform	<5			<5											
1,1 Dichloroethene	5			19	17										
1,2 trans-Dichloro-ethene	57	12		410	350	28							65	<5	400
1,2, Dichloropropane		<5		7.8	7.5								<10		16
Ethyl Benezene															
Methylene Chloride	<5														7
Fluorotrichloro-methane				<5	<5										
Tetrachloroethene	54	22		500	11100	6.1							10	<5	57
Toluene		<5	<5	<5	<5						<5			<5	
Trichloroethene	33	57		790	860	<5							9	<5	140
Vinyl Chloride													11		22

TABLE - 7 RESULTS FROM THE ANALYSES OF
THE VOLATILE FRACTION OF ORGANIC PRIORITY POLLUTANTS
(Concentration - PPB)

(Continued)

Identified Organic Compound	WELLS									
	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
Volatiles										
Benzene	8.9		15	5		12	7.4			
Carbon Tetrachloride										
1,2 Dichloroethane	<5									
1,1,1 Trichloroethane	<5				13	9.1		<5		12
1,1 Dichloroethane	32				16	46	22			12
1,1,2 Trichloroethane										
Chlorobenzene			<5							
Chloroethane			<10							
Chloroform										
1,1 Dichloroethene			20							
1,2 trans-Dichloro-ethene			18	29	210	230	73	<5		710
1,2, Dichloropropane	7		12			<5				<5
Ethyl Benezene			27			5.3				
Methylene Chloride	<5					10	55			
Fluorotrichloro-methane						<5	<5			
Tetrachloroethene	42		<5		11	49	51	<5		23
Toluene						44				
Trichloroethene	94		<5		13	100	57			35
Vinyl Chloride	19		11			40	21			

TABLE 8 - NON-PRIORITY IDENTIFIED ORGANIC COMPOUNDS
(Concentration - PPB)

Identified (Non-Priority) Organic Compound	WELLS													
				B-4				B-6D						
	B-1	B-2	B-3	B-4	Dup.	B-5	B-6S	B-6D	Dup.	B-7	B-8	B-9	B-10	B-11	B-12
Acetone		<100				160				230	400	1300		630	1200
2-Hexanone			<100												
Styrene						<5									
O-Xylene				<5	<5										

TABLE 8 - NON-PRIORITY IDENTIFIED ORGANIC COMPOUNDS
(Concentration - PPB)

(Continued)

Identified Organic Compound (Non-Priority)	WELL									
	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
Acetone		150		300						
2-Hexanone						<100				
Styrene			<5							
O-Xylene			8							

TABLE - 9 TENTATIVELY IDENTIFIED COMPOUNDS
(Presence Detected - X)

Identified (Tentatively) Organic Compound	WELLS													
	B-1	B-2	B-3	B-4	B-4 Dup.	B-5	B-6S	B-6D	B-6D Dup.	B-7	B-8	B-9	B-10	B-11	B-12
1,2 Benzenedicarboxylic acid butyl 2-methylpropylester												X			
Benzene 1,3-Dimethyl															X
Cyclo Hexane															X
1,4 Dioxane				X	X										X
Ethane 1,1-Oxybis															
Ethane 1,1-Oxybis/2-chloro														X	
Ethane 1,1,1 Trichloro				X											
Ethane, Tetrachloro				X	X										X
Ethane, Trichloro				X	X										
Mehane, Dichlorofluoro															X
2-Pentanone-4-Hydroxy-4 Methyl	X	X	X	X	X		X			X	X	X		X	X

TABLE - 9 TENTATIVELY IDENTIFIED COMPOUNDS
(Presence Detected - X)

(Continued)

Identified (Tentatively) Organic Compound	WELLS									
	B-13	B-14	B-15	B-16	8630 Lyford	8635 Lind	8554 Baxter	8800 McClellan	8811 Palmer	Scale House
1,2 Benzenedicarboxylic acid butyl 2-methylpropylester		X				X		X		
Benzene 1,3-Dimethyl	X					X				
Cyclo Hexane										
1,4 Dioxane					X					
Ethane 1,1-Oxybis										
Ethane 1,1-Oxybis/2-chloro										
Ethane 1,1,1 Trichloro										
Ethane, Tetrachloro	X					X				X
Ethane, Trichloro						X	X			X
Mehane, Dichloro-fluoro	X									
2-Pentanone-4-Hydroxy-4 Methyl	X	X		X	X	X	X		X	X

7 - SUMMARY AND CONCLUSIONS

7.1. SUMMARY

The Acme Solvents - Pagel's Pit study area is located in extreme southern Winnebago County, Illinois. Drinking water tests that were conducted by the Illinois Environmental Protection Agency and the Winnebago County Health Department showed positive contamination by organic volatile pollutants. As a result of this testing, area residents now utilize bottled drinking water. Suspected groundwater contamination sources include Acme Solvents Reclaiming, Inc., and the Pagel's Pit Landfill.

After initial background and geophysical work, Ecology and Environmental Inc. installed seventeen (17) groundwater monitor wells in order to evaluate the extent of contamination. Six (6) private wells in addition to the seventeen (17) monitor wells were sampled in October, 1982. The data from the analyses showed significant contamination of the groundwater system by organic priority pollutant compounds.

7.2 CONCLUSIONS

7.2.1 General Study Area

Soils in the upland areas east of Pagel's Pit are well to excessively well drained, thus promoting downward migration of contamination rather than surficial movement.

A small surface water tributary to Killbuck Creek was not contaminated at the time of sampling by Ecology and Environment.

A spring which surfaces behind the Pagel's Pit Landfill and enters Killbuck Creek contains evidence of organic volatile contamination. Although sampling of this spring was conducted by IEPA personnel this information is included to define the extent of contamination and to demonstrate that sub-surface contamination has the potential to enter the surface water system.

The groundwater flow direction is primarily westerly however, during precipitation events a southern component to the flow is apparent and will affect the migration of contamination. The groundwater flow direction is influenced locally by the presence of a tributary to a buried bedrock valley.

Little contamination was detected in wells B-7 and B-9. The cause of this may be due to bedrock fracture patterns which may have diverted water and thereby contaminants from these wells.

Fractures and weathering of the dolomitic bedrock are a pathway for a considerable downward gradient. Thus, contamination may be as deep as the Glenwood or St. Peter sandstone in the study area.

7.2.2 "Upgradient" Wells

Well B-1 is contaminated by compounds which are found in the acid and volatile organic fractions.

Well B-2 is contaminated by compounds from the acid, base neutral and volatile organic fractures.

The majority of acid and base neutral compounds detected are coal tar products used in the manufacture of asphalt. Rockford Blacktop, an asphalt manufacturer, is located adjacent to wells B-1 and B-2. Although Rockford Blacktop is a potential source of this contamination the scope of work for this project does not allow for verification of this assumption at this time. Additionally, since both wells B-1 and B-2 are near the groundwater high (see plates 4A and 4B) these contaminants may be derived from the Acme Solvents area.

7.2.3 Acme Solvents

The soils on the Acme Solvents, Inc., property are contaminated by organic volatiles.

The results of a March, 1982 magnetometer study indicate the presence of several large areas containing buried ferro-magnetic objects which are interpreted as barrels.

Well B-4, immediately adjacent to the Acme Solvent property, is contaminated by numerous organics. The concentration of organics found in well B-4 are considerably higher than those found in the other wells.

Although some volatiles were found in up gradient wells B-1 and B-2, many additional volatiles are contained in the B-4 sample. This additional contamination originates from the Acme Solvent Inc., property.

The presence of volatile organics in the deeper (200'-300') private wells at 8635, 8630, 8554, 8800 and the Scale House well on Lindenwood Road indicate the downward migration of volatiles in the Galena-Platteville aquifer.

Well B-3 has been shown to be at a greater hydraulic potential than other wells in the area. The small amount of contamination by toluene is probably outside the main contaminant plume.

7.2.4 Pagel's Pit

Although no evidence of groundwater mounding was detected during water level measurements, mounding is known to be a common occurence near landfills. This phenomenon would explain the presence of coal tar by-products (acid and base neutral fractions) found in well B-11. Since no contamination by these compounds occurs in wells between B-2 and B-11, this contamination is apparently due to the asphalt liner used in the Pagel's Pit Landfill.

Well B-15 has an arsenic concentration of 30ppb. This arsenic apparently comes from Pagel's Pit.

Well B-14 and the Palmer well at 8811 Lindenwood Road show no evidence of contamination at this time. Therefore, the lateral extent of contamination extends between wells B-13 and B-14 and continues westerly to Killbuck Creek in the shallow aquifer system.

Volatile organics were detected in wells B-11, B-12, B-13, B-15 and in private wells at 8635, 8630, 8554, 8800 and the Scale House on Lindenwood Road. In addition to the organics found in B-4, adjacent to Acme Solvents, these wells contain other organic compounds. The source of these additional compounds may be the Pagel's Pit Landfill.

Although few well logs for the private wells sampled were available, it is known that the Lyford well (8630 Lindenwood Road) is screened at a depth of nearly 300 feet (personal communication). Since this well was found to be contaminated with several volatile organic compounds, it is apparent that the vertical extent of contamination may be at a depth of 300 feet. However, since the construction of the well is unknown, contamination may be from an upper level aquifer.

8 - RECOMMENDATIONS

Continue supplying bottled water for area homes.

Removal of wastes from Acme Solvents property for proper disposal.

Quarterly sampling of wells prior and subsequent to removal of Acme Solvents waste. Limit analysis to detection of volatiles, acids and base neutral priority pollutants.

A feasibility study for clean-up of the shallow aquifer.

The investigation of deeper bedrock aquifer (St. Peter) for contamination.

Treatment of the spring flow to Killbuck Creek for removal of organic compounds.

Determine extent of coal tar derivatives contamination (Pagel's Pit and Rockford Blacktop).

Determine source(s) of volatile contamination up- gradient of Acme Solvents.

Confirmation of mounding phenomenon near Pagel's Pit landfill by installation of additional wells/piezometers in order to ascertain sources of coal tar derivatives and volatiles in private home and monitor wells.

Location of at least two (2) additional monitor wells north of Acme Solvents and west of Rockford Blacktop in order to aid in determination of groundwater flow direction and contaminant source(s) of wells B-1 and B-2.

9 - REFERENCES

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APPENDIX

WELLS FOR

ACME SOLVENTS/PAGEL'S PIT

DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-1

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9-29-82

Completion Date 10-1-82

Ground El. 210.35'

Groundwater El.
at completion

after 24 days 169.22'

Total Depth of Boring 51.7'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=212.70	
210.35	0	Ground Surface				
	1	Dark Brown silty fine sand.	3		3 1/4" I.D. hollow stem auger	
	2		3	1	2" O.D. split spoon	
	3	Brown fine sand (trace silt).	2		140 lb. hammer 30" drop	
	4		2	2		
	5		2			
	6		4			
	7					
	8					
	9				Moist @ 8.0'	
	10	Light brown fine sand.	1			
			2	3		
			4			

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Site Acme Solvents | Page 2 of 4

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13				(Some seams of all silt)	
	14	Tan to gray clayey silt (orange mottles).	2			
			5	4		
	15		9			
	16					
	17					
	18					
	19		5			
			8	5	Trace fine sand	
	20		8	5		
	21					
	22					
	23				Wet seam @ 23.0 Hit Bedrock 23.5	
	24	Weathered bedrock.	7			
			30	6	Tri-cone roller bit 23.5'-42.5' 2" O.D. split spoon. air	
	25		21			
	26					
	27					
	28					
	29		32			
			30	7		
	30		24			

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State Illinois | Boring No. B-1

Site Acme Solvents | Page 3 of 4

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31					
	32					
	33					
	34		30	8		
			32			
	35		60/5			
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43	42.5-42.7 - Broken core, gravel size.	100/4	9	9/30/82 - 0740 Run #1 42.5-46.5	
	44	42.5-43.6 - Calcareous dolomite, light gray with tan staining,			Diamond bit, NQ water core	
	45	fine crystalline moderately weathered, moderately hard,			4.0/1.1/-2.9 24% Rec.	
	46	heavily pitted.			70% RQD/.20 fpm 0800	
	47	43.6-46.5 Lost Core.			120 RPM/550 psi	
	48	Weathered & fractured bedrock.			0800 Roller bit to	
	49				51.7	
	50					

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Boring No. B-1

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	51					
	52				Bottom of hole 51.7'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-2

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 10-1-82

Completion Date 10-5-82

Ground El. 229.82'

Groundwater El.
at completion

after 20 days 168.86'

Total Depth of Boring 73.5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=232.02	
229.82	0	Ground Surface				
		Black silt (trace fine sand).			3 1/4" I.D. hollow stem auger	
	1		14			
			15	1	2" O.D. split spoon	
	2	Gray to brown silty fine to coarse sand and gravel.	12			
	3				140 lb. hammer 30" drop	
	4		22			
			30	2		
	5		33			
	6					
	7					
	8				Cobble size @ 8.0'	
	9		22			
			40	3		
	10		36			

State Illinois Boring No. B-2

Site Acme Solvents Page 2 of 5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14		16	4		
			42			
	15		38			
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23	Weathered bedrock.				
	24				Hit Bedrock 23.5 Tri-cone roller bit with air 23.5'-27.2'	
	25					
	26					
	27	27.2'-46.1 calcareous dolomite, light gray with tan stain, fine crystalline, moderate to slighly weathered, moderately hard heavily pitted with light brown stain, numerous vugs.			10/1/82 1245 Run #1 27.2'-37.3' Diamond Bit, NQ Air core 10.0'/1.0'/-9.1'	
	28					
	29					
	30					

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State Illinois Boring No. B-2

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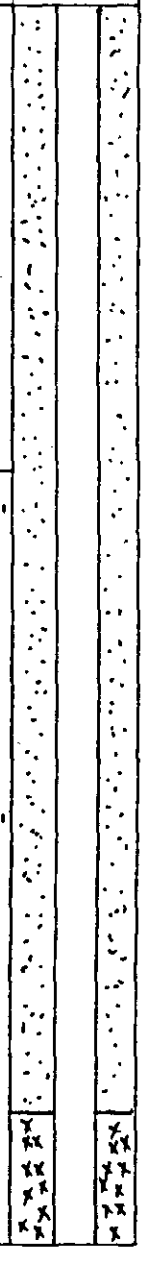
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		27.2'-28.2' Broken and			10% Rec.	
	31	fractured.			0% RQD/.16 fpm	
		28.2'-37.3 Lost core.			120 Rpm/500 psi	
	32					
		37.65'-37.9' Broken and				
	33	fractured core, gravel size.				
		38.1'-38.5' Heavily pitted with				
	34	light brown stain.				
		38.3' Horizontal tight fracture				
	35	38.7'-39.6 Zone of numerous				
		small vugs.				
	36	40.1'-41.0' Open fracture <80°.				
		41.2'-41.4' Vuggy zone with				
	37	heavy light brown stain.				
		41.4'-41.7' Numerous tight			1340	
	38	horizontal fractures.			1410	
		42.2' Vug.			Run #2 37.3'-42.8'	
	39	42.25'-42.4' Fractured core.			Diamond bit, NQ	
		42.7'-42.8' Lost core.			Air core	
	40	43.25' Tight horizontal fracture.			5.5/5.4/-0.1	
		43.4' Brown shale parting.			99% Rec.	
	41	43.5'-44.1' Vuggy and heavily			56% RQD/.18 fpm	
		pitted with light brown stain.			120 Rpm/500 psi	
	42	44.3' Tight horizontal fracture.				
		44.95'-45.05' Heavily stained			1440	
	43	and pitted vug.			10/4/82 1305	
		45.05' Tight horizontal fracture			Run #3 42.8'-52.6'	
	44	45.1'-46.1' Very slightly pitted			Diamond bit, NQ	
		and weathered.			Air core	
	45	46.1-73.5 Dolomitic limestone,			9.8/9.8/0.0	
		light gray with tan stain, fine			100% Rec.	
	46	crystalline, moderately to			79% RQD/.12 fpm	
		slightly weathered, moderately			120 Rpm/500 psi	
	47	hard, heavily pitted with light				
		brown stain, numerous Vugs.				
	48					
		46.6'-46.9' Open fractures <50°				
	49	47.5'-48.3' Vuggy with heavy				
		pitting and light brown stain.				
	50					



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State Illinois | Boring No. B-2

Site Acme Solvents | Page 4 of 5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	51	48.7'-49.2' Pitted with heavy light brown stain.				
	52	49.5'-49.6' Vug with light brown stain.				
	53	50.4'-50.55' Fractured core. 50.65' Vug.			1425 1505	
	54	51.6'-51.9' Vuggy with pitting and light brown stain.				
	55	52.6'-53.1' Light brown stain. 53.9' Vug light brown stain.			Run #4 52.6'-63.3' Diamond bit, NQ Air core 10.7/2.6/-8.1 24% Rec. 13% RQD/.13 fpm 120 Rpm/500 psi	
	56	54.65'-54.9' Broken core gravel size.				
	57	55.2'-63.3' Lost core.				
	58					
	59					
	60					
	61					
	62					
	63	63.3'-64.1' Heavily pitted with light brown stain.			1630 1705	
	64	65.0'-65.6' Heavily pitted with vugs and heavy light brown stain			Run #5 63.3'-73.5' Diamond bit, NQ Air core 10.2/10.2/0.0 100% Rec. 60% RQD/.17 fpm 120 Rpm/500 psi	
	65	65.8'-66.0' Broken and fractured core.				
	66	66.0'-66.5' Tight vertical fracture.				
	67	66.2'-68.3' Heavily pitted with light brown stain and vugs.				
	68	68.6'-68.7' Broken core gravel size.				
	69	68.8'-69.0' Vugs, light brown stain.				
	70	69.5'-69.7' Small vuggy zone.				

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Boring No. B-2

Site Acme Solvents

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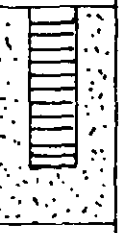
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	71	70.05'-70.1' Heavily pitted with light brown stain. 71.1'-71.3' Large vuggy zone heavy light brown stain. 72.1'-73.2' Open vertical fracture, light brown stain. 73.2'-73.5' Broken and fractured core, gravel size.			1805	
	72					
	73					
	74				Bottom of hole 73.5	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-3

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9-28-82

Completion Date 9-28-82

Ground El. 181.87'

Groundwater El.
at completion

after 27 days 178.20'

Total Depth of Boring 40.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=184.59	
181.87	0	Ground Surface				
	1	Black silt (trace clay).	3		3-1/4" I.D. Hollow stem auger	
	2		5	1	2" O.D. split spoon	
		Dark brown silty clay.	4		140 lb. hammer	
	3				30" drop	
		Light brown sand fine to medium (wet).		2		
	4		2			
			3	3		
	5		5			
		Gray and light brown silty clay (mottled).				
	6					
					Trace sand and gravel	
	7	Light brown silty clay.				
	8					
	9		3			
		Light brown silty very fine sand (wet).	9	4		
	10		13			

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State Illinois

Site Acme Solvents

Boring No. B-3

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12	----------				
	13	Gray silty very fine sand (trace clay-wet).				
	14		9	5		
	15		14			
	16		14			
	17	----------				
	18	Gray silt (damp).				
	19		8	6		
	20		15			
	21	----------	17			
	22	Gray clayey silt (trace gravel).				
	23					
	24		9	7	Sand seam 24.0'-24.5'	
	25		11			
	26		17			
	27					
	28					
	29		2	8	Wet trace fine sand	
	30		2			
			5			

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State Illinois

Site Acme Solvents

Boring No. B-3

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31					
	32					
	33					
	34		6		Sand seam @ 34.0'	
			10	9		
	35	Gray silty clay (trace gravel).	13			
	36					
	37					
	38					
	39		6			
			10	10		
	40		14			
					Bottom of hole 40.0	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-4

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9-21-82

Completion Date 9-21-82

Ground El. 194.76'

Groundwater El.
at completion

after 29 days 168.22'

Total Depth of Boring 37.5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=197.27	
194.76	0	Ground Surface				
	1	Black silt (trace very fine sand,	4		3-1/4" I.D. Hollow stem auger	
			4	1	2" O.D. Split spoon	
	2	Dark brown very fine sandy silt,	4		140 lb. hammer	
	3				30" drop	
		Brown silty fine sand.				
	4		4			
		Dark brown clayey fine sand	5	2		
	5	(trace silt),	8			
	6					
	7					
	8					
		Bedrock.				
	9				Tri-cone roller bit 8.0'-22.5'	
	10					

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State Illinois Boring No. B-4

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23	22.5'-37.5' Calcareous dolomite light gray with tan to light brown stain, very fine crystalline, moderately hard, pitted with some fractures.			9/21/82 1150 Run #1 22.5'-32.5' Diamond bit, NQ Air core 10.0/6.7/-3.3 67% Rec. 39% RQD/.09 fpm 100 Rpm/550 psi	
	24					
	25	22.5'-25.6' Lost core.				
	26					
	27	27.0'-27.9' Broken and fractured core.				
	28	28.1'-28.6' Near vertical open fracture.				
	29	28.7'-28.9' Generally vertical open fracture.				
	30					

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State Illinois

Boring No. B-4

Site Acme Solvents

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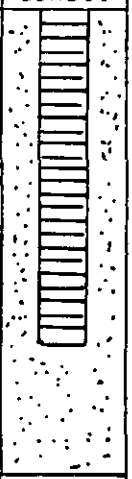
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	31.6'-31.9' High angle fractured core.			Encountered water at 32.0	
	32	31.9'-32.1' Broken core, gravel size.			1520	
	33	32.7'-37.5' Gray with light brown stain and small vugs, more heavily pitted.			1555	
	34	34.6'-34.8' Tight vertical fractures.			Run #2 32.5'-37.5' Diamond bit, NQ water core 5.0/5.2/+0.2 100% Rec. 80% RQD/6.2 fpm 200 Rpm/550 psi	
	35	34.9' White chert nodule.				
	36	35.35'-35.5' Open vertical fracture.				
	37	35.8' Horizontal tight fracture. 36.4'-36.5' White chert nodule.			1603	
	38				Bottom of hole 37.5	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-5

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9-27-82

Completion Date 9-28-82

Ground El. 190.09'

Groundwater El.
at completion

after 27 days 165.00'

Total Depth of Boring 35.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=192.60	
190.09	0	Ground Surface				
	1	Black silt (trace very fine sand.	3		3-1/4" I.D. Hollow stem auger	
			3	1	2" O.D. Split spoon	
	2		3		140 lb. hammer	
	3				30" drop	
		Brown/orange clayey fine sand				
	4	(trace gravel,trace silt,moist).	4	2		
			4			
	5	Tan fine sand(trace gravel wet).	5			
	6					
	7	Gray silty clay (trace gravel, trace silt).				
	8					
	9		12		Orange mottling	
			11	3		
	10		16			

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State Illinois Boring No. B-5

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12	Gray clay (trace silt).				
	13					
	14		2			
			2	4		
	15		4			
	16					
	17					
	18				Some wet fine sand seams	
	19		2			
			3	5		
	20		4			
	21					
	22					
	23	Light brown silty clay (trace moist sand).				
	24		3			
		Light brown silty clayey fine	4	6		
	25	sand (wet).	4			
	26					
	27					
	28					
	29	Brown silty clay (trace sand and gravel).	3			
			5	7		
	30		8			

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State Illinois

Site Acme Solvents

Boring No. B-5

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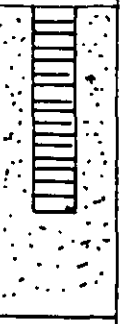
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Brown silty fine to very fine sand and gravel.				
	32					
	33					
	34		5			
			9	8		
	35		22			
					Bottom of hole 35.0	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-6S

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9-20-82

Completion Date 9-21-82

Ground El. 191.56'

Groundwater El.
at completion

after 29 days 165.76

Total Depth of Boring 48.3'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=193.80	
191.56	0	Ground Surface				
	1	Black silt (trace very fine sand.	6		3-1/4" I.D. Hollow stem auger 2" O.D. Split spoon 140 lb. hammer 30" drop	
			6	1		
	2	Dark brown to brown very fine sandy silt.	6			
	3					
		Dark brown clayey fine sand and gravel.	5	2		
	4		4			
	5	Tan fine sand and gravel (trace silt).	5			
	6					
	7					
	8					
	9		30			
			40	3		
	10		60/5			

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State Illinois

Boring No. B-6S

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13				Moist @ 14.0' (trace coarse sand)	
	14		10	4		
	15		35 25			
	16					
	17					
	18	Bedrock.			Tri-cone roller bit 18.0'-52.0' Air see well log B-6D for rock core detail	
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

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State Illinois

Boring No. B-6S

Site Acme Solvents

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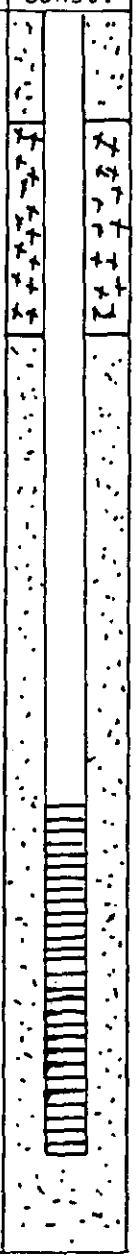
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Bedrock.				
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	4					
	4					
	45					
	46					
	47					
	48					
	49					
	50					

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State Illinois

Boring No. B-6S

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	51	Bedrock.				
	52				Bottom of hole 52.0	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-6D

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9/22/82

Completion Date 9/23/82

Ground El. 191.28'

Groundwater El.
at completion

after 27 days 162.29'

Total Depth of Boring 100.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
191.28	0	Ground Surface			T.I.C.=193.94	
	1	For overburden description see well log B-6S.			3-1/4" I.D. Hollow stem auger No samples 0'-20.0'	
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					

State Illinois Boring No. B-6D

Site Acme Solvents Page 2 of 6

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18	----------				
		Bedrock.			Tri-cone roller bit with water 18.0'-20.0'	
	19					
	20	20.0'-58.4 Calcareous dolomite, gray with light brown stain, very fine crystalline, moderately hard, pitted with			9/22/82 1300 Run #1 20.0'-24.7' Diamond bit, NQ water core 4.7/1.8/-2.9 38% Rec. 9% RQD/.24 fpm 200 Rpm/450 psi	
	21					
	22	numerous tight fractures, numerous vugs.				
	23	20.8'-21.1' Broken fractured				
		+ core, gravel size.				
	24	21.3'-21.6'				
		21.8'-24.7' Lost core 2.9'			1320	
	25	(accumulated).			1340	
		24.95'-25.2' White chert.			Run #2 24.7'-35.0'	
	26	25.4'-26.3' Vugs with heavy light brown stain.				
	27	27.5'-27.75' Vugs with heavy light brown stain.			10.3/10.3/0 100% Rec. 89% RQD/.45 fpm	
	28	27.9'-28.2' Vugs with heavy light brown stain.				
	29	28.2'-28.3' Open vertical fractures,				
	30					

State Illinois | Boring No. B-6D

Site Acme Solvents | Page 3 of 6

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		28.65'-28.75' White chert band.				
	31	29.0'-29.1 Numerous horizontal tight fractures.				
	32	29.35'-29.45' White chert nodule				
		29.7'-29.8' Tight fracture 30°				
	33	angle.				
		29.8-30.0' Vug with heavy light				
	34	brown stain.				
		31.0'-31.1' Vuggy zones with				
	35	+ > heavy light brown			1403	
		31.6'-31.7' stain.			1415	
	36	32.5' White chert nodule.			Run #3 35.0'-45.0'	
		33.1'-33.2' Vug with heavy light				
	37	brown stain.			10.0/10.2/	
		33.6'-33.9' White chert nodule			100% Rec.	
	38	zone.			65% RQD/.33 fpm	
		34.15' Fossil.				
	39	37.4'-37.6' Vertically open fractured core.				
	40	37.9'-38.1' Tight fracture 60°.				
		38.55' Tight horizontal fracture				
	41	39.4'-39.5' Tight vertical fracture.				
	42	40.8'-41.1' Small vuggy zone.				
	43	43.9' Fossil.				
	44					
	45	45.0'-58.4' Light brown to tan.			1445	
		44.45'-45.5' Heavily pitted.			1510	
	46	46.0'-46.2' Heavily pitted with tight fractures.			Run #4 45.0'-55.0'	
	47	46.55'-46.65' White chert nodule			10.0/10.0/0	
		47.05'-47.1' Heavily pitted.			100% Rec.	
	48	47.5' Tight nearly horizontal fracture.			43% RQD/.25 fpm	
	49	48.1'-48.3' White chert nodules.				
	50					

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State Illinois Boring No. B-6D

Site Acme Solvents Page 4 of 6

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		50.1'-50.3' Vug with heavy light				
	51	brown stain.				
		51.2'-51.7' White chert bed.				
	52	52.2'-52.3' Vug with heavy light				
		brown stain.				
	53	52.5'-52.65' White chert nodule.				
		53.1'-53.5' Vuggy zone with				
	54	heavy light brown stain.				
		53.7'-53.9' White chert nodules.				
	55	54.05' Tight horizontal			1535	
		fractures.			1555	
	56	54.25' Tight horizontal			Run #5 55.0'-65.0'	
		fractures.			10.0/9.8/-0.2	
	57	54.25'-54.45' White and			98% Rec.	
		blue/gray chert bed.			81% RQD/.35 fpm	
	58	54.7' White chert nodules.				
		54.5'-55.8' Vuggy and heavily				
	59	weathered zone.				
		55.5'-55.6' White with blue/gray				
	60	chert zone.				
		57.1'-57.3' Broken white with				
	61	blue/gray chert zone.				
		57.6'-57.7' Heavily pitted.				
	62	57.85' White chert nodule.				
		58.0' Vug with heavy light brown				
	63	stain.				
		58.25'-58.35' White with				
	64	blue/gray chert nodule.				
		58.4'-70.9' Calcareous dolomite				
	65	gray with light brown stain,			1625	
		very fine crystalline,			1645	
	66	moderately hard, vuggy with			Run #6 65.0'-75.0'	
		heavy light brown stain, few			10.0/10.0/0	
	67	horizontal tight fractures,			100% Rec.	
		pitted, contains chert.			73% RQD/.33 fpm	
	68	58.4'-58.55' White with				
		blue/gray chert zone.				
	69	58.9' Brownish green shale				
		parting.				
	70	59.3'-59.4' White with				
		blue/gray chert nodule.				
		60.6'-60.75' White with				
		blue/gray chert nodule.				

State Illinois Boring No. B-6D

Site Acme Solvents Page 5 of 6

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		61.2-61.35' White with blue/gray				
	71	chert seam.				
		62.9'-63.5' Large pitted zone				
	72	with tight generally horizontal				
		fractures.				
	73	63.5',63.9'-64.0' Brownish green				
		horizontal shale partings.				
	74	64.0'-64.6' Pitted with numerous				
		tight generally horizontal				
	75	fractures.			1715	
		64.8'-65.0' Lost core (0.2').			9/23/82 0720	
	76	65.3',65.6'-65.65' Brownish			Run #7 75.0'-85.0'	
		green horizontal shale partings.			10.0/9.8/-0.2	
	77	65.4'-66.5' Horizontal tight			98% Rec.	
		fracture.			84% RQD/.25 fpm	
	78	67.1'-67.3' Vug with heavy light				
		brown stain.				
	79	70.9'-77.4' Dolomitic limestone,				
		gray with light brown stain,				
	80	very fine crystalline,				
		moderately hard, heavily pitted,				
	81	numerous tight shale parting				
		lined fractures generally				
	82	horizontal.				
		71.2'-71.7' Numerous tight				
	83	vertical fractures.				
		71.7'-72.5' Open fractures				
	84	generally vertical.				
		72.6'-73.3' Open fractures 80.				
	85	73.0' Vug with dolomite			0800	
		crystals.			0835	
	86	73.85' Brownish green shale			Run #8 85.0'-95.0'	
		parting.			10.0/10.2/+0.2	
	87	74.5'-74.85' Open vertical			100% Rec.	
		fracture.			59% RQD/.20 fpm	
	88	74.85'-75.0' Broken and				
		fractured core gravel size.				
	89	75.0'-76.0' Open vertical				
		fracture.				
	90	76.5'-76.6' Heavily stained vug.				
		77.4'-100.0' Dolomite, light				
		gray, fine crystalline, hard to				
		very hard, pitted with some				
		vugs, gray shale partings				
		numerous tight shale-lined				
		fracture partings.				
		78.2',78.8'-79.1' Gray shale				
		partings horizontal, (open).				

State Illinois

Boring No. B-6D

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		78.9'-79.25' Heavily pitted with vugs zone.				
	91	80.15'-80.3' Heavily pitted with vugs zone.				
	92	80.7',81.05',81.15',81.9' Gray shale partings, horizontal (open).				
	93	81.8' Vug.				
	94	83.8' Gray shale parting 20.				
		84.15'-84.25' Large pitted zone.			0915	
	95	84.25' Horizontal gray shale parting.			0945	
		84.6'-84.7' Gray shale seam.			Run #9	
	96	85.15'-85.3' Heavily pitted with small vugs.			95.0'-100.0'	
	97	86.75' Vug with white chert nodule.			5.0/5.0/0	
	98	87.1',87.2',87.65',87.7' Horizontal gray shale partings.			100% Rec.	
	99	87.2'-87.3' Pitted with tan stain.			56% RQD/.25 fpm	
	100	87.95'-88.1' Heavily pitted with vug, heavily stained light brown.			Bottom on hole 100.0'	
		88.3',88.65',89.3' Gray horizontal shale partings.				
		89.2'-90.1' Dark gray with quartz filling and shale partings.				
		90.1'-91.4' Pitted with vugs, tan staining throughout, no shale partings.				
		91.4'-94.5' Gray with large scattered pits and numerous gray shale partings (horizontal).				
		94.15' Gray shale "nodule".				
		94.5'-96.1 Tan stained zone no shale partings.				
		96.1'-100.0' Dark gray dolomite with infrequent shale partings.				
		96.7'-96.8' Vug.				
		98.1' Pitted.				

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-7

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9/17/82

Completion Date 9/20/82

Ground El. 188.41'

Groundwater El.
at completion

after 30 days 168.43'

Total Depth of Boring 33.5'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=191.37	
188.41	0	Ground Surface				
	1	Black silt (trace fine sand),			3-1/4" I.D. Hollow stem auger 2" O.D. Split spoon 140 lb. hammer 30" drop	
	2	Brown fine sandy silt,	7 5 3	1		
	3	Brown silty very fine sand (trace weathered stone).				
	4		3 3 7	2		
	5					
	6					
	7					
	8					
	9	Bedrock.	19 60/5	3		
	10					

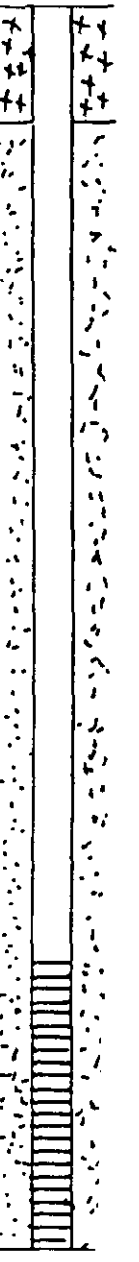
State Illinois

Boring No. B-7

Site Acme Solvents

Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Very soft rock-could not core.				
	12					
	13					
	14					
	15				Tri-cone roller bit 13.5' to 31.0' Air Due to softness of rock no core samples attempted. Drilled at rate of 2 fpm at times.	
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					



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State Illinois

Boring No. B-7

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Bedrock.				
	32					
	33					
	34				Bottom of hole 33.5'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-8

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9/27/82

Completion Date 9/27/82

Ground El. 186.88'

Groundwater El.
at completion

after 28 days 159.90'

Total Depth of Boring 35.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=189.72	
186.88		Ground Surface				
	1	Black silt.			3-1/4" I.D. Hollow stem auger	
			6		2" O.D. Split spoon	
	2		7	1		
			9		140 lb. hammer	
	3	Light brown to gray silty clay (trace gravel).			30" drop	
	4				Orange Mottling	
			12			
	5		12	2		
			14			
	6					
	7					
	8				NOTE - No stone in clay	
		Gray clay (trace silt).				
	9		3			
			7	3		
			10			

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State Illinois Boring No. B-8

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Gray clay.				
	12					
	13					
	14		3	4	Wet at 15.0'	
	15		5			
	16		6			
	17					
	18				Small seams of very fine sand which are wet	
	19		4	5		
	20		5			
	21		9			
	22					
	23					
	24		3	6		
	25		5			
	26		6			
	27					
	28				"Very stiff"	
	29		3	7		
	30		5			
			6			

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State Illinois

Boring No. B-8

Site Aceme Solvents

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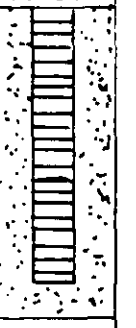
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Gray clay				
	32					
	33					
	34		4		Wet very fine	
			4	8	sandy seams	
	35		11			
					Bottom of hole 35.0'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-9

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9/16/82

Completion Date 9/17/82

Ground El. 194.83'

Groundwater El.
at completion

after 38 days 160.02'

Total Depth of Boring 42.5'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
194.83		Ground Surface			T.I.C.=198.10	
	1	Dark brown silt, (trace sand)			3-1/4" I.D. Hollow stem auger 2" O.D. Split spoon 140 lb. hammer 30" drop	
	2	Brown silty clay.	7 9 9	1		
	3					
	4					
	5	Light brown to gray clay, trace silt (very heavy).	23 20 22	2		
	6					
	7					
	8					
	9	Light brown very fine sandy silt (moist).	5 8	3	Encountered bedrock at 9.5'	
	10	Weathered bedrock.	56			

State Illinois Boring No. B-9

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Weathered bedrock.				
	12					
	13					
	14					
	15				Tri-cone roller Bit with air 15.0'-22.5'	
	16					
	17					
	18					
	19					
	20	22.5'-42.5' Dolomitic limestone, tan with light brown-stain, very fine crystalline, moderately weathered, moderately hard, pitted, slightly fractured with a a few vugs.				
	21					
	22					
	23	22.5'-23.1' Broken and fractured core, gravel size.			9-16-82 1020	
	24	23.6'-24.0' Broken and fractured core, gravel size.			Run #1 22.5'-34.5' Diamond bit, NQ Aircore 12.0/10.1/-1.9'	
	25	24.1'-24.7' Pitted with small vugs containing dolomite crystals.				
	26	25.2-25.6' Heavy tan stain				
	27	27.8'-28.0' Tight, nearly horizontal fractures.			82% Rec. 58% RQD/.17 fpm	
	28	29.2'-29.4' Broken and fractured core, gravel size.				
	29	29.6'-30.0' Pitted with small vugs with dolomite crystals,				
	30					

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Boring No. B-9

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	31.1', 31.5' Vugs with dolomite crystals.				
	32	32.5'-34.1' Lost core accumulated 1.6'.				
	33					
	34					
	35	36.0'-36.5' Tight, nearly vertical fracture.				
	36	36.4'-36.5' Numerous tight fractures various orientations.			1135 1405	
	37	36.6'-36.9' Tight fracture, high angle.			Run #2 34.5'-42.5' 8.0/8.4/+.4	
	38	38.2'-38.3' Vugs with dolomite crystals.			100% Rec.	
	39	39.0'-39.3' Pitted with small vugs.			100% RQD/.106 fpm	
	40	40.4'-40.5' White to blue/gray chert seam.				
	41	40.9'-41.15' White to blue/gray chert seam.				
	42	42.1' White chert.			1520	
	43	42.3'-42.5' Broken core from removal from barrel, gravel size with some white chert.				
					Bottom of hole 42.5'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-10

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 10/7/82

Completion Date 10/7/82

Ground El. 181.38'

Groundwater El.
at completion

after 18 days 151.80'

Total Depth of Boring 40.0'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
181.38		Ground Surface			T.I.C.=183.83	
	1	Dark brown to black fine sandy silt.			3-1/4" I.D. Hollow stem auger 2" O.D. Split spoon 140 lb. hammer 30" drop	
	2		6			
			4	1		
	3	Dark brown silty fine sandy clay.	4			
	4					
		Light brown silty fine to	6			
	5	medium sand and gravel.	6	2		
			8			
	6					
	7	Brown mostly fine to medium sand and gravel.				
	8					
	9		24			
			30	3		
	10		33			

State Illinois Boring No. B-10

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Light brown silty fine sand.				
	12					
	13					
	14	Light brown fine to medium sand and gravel.	3 9 10	4		
	15					
	16					
	17					
	18	Light brown fine sand.				
	19		6 10 12	5		
	20				Moist at 20.0'	
	21	Brown to tan, fine to coarse sand and gravel.				
	22					
	23					
	24		12 16 15	6		
	25					
	26					
	27					
	28					
	29	Bedrock.	60/0	7	Tri-cone roller bit with air 28.5'-40.0'	
	30					

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State Illinois

Boring No. B-10

Site Acme Solvents

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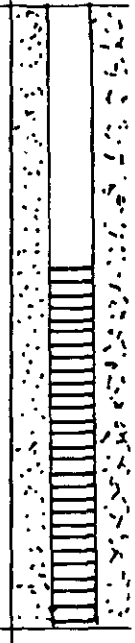
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Weathered bedrock.				
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
					Bottom of hole 40.0'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-11

Drilling Firm Warzyn

Type of Drill CME 55

Driller L. Smith

Geologist Tom Koch

Start Date 9/23/82

Completion Date 9/24/82

Ground El. 197.32'

Groundwater El.
at completion

after 31 days 157.56'

Total Depth of Boring 47.3'

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
197.32		Ground Surface			T.I.C.=200.27	
	1	Black silt.			3-1/4" I.D. Hollow stem auger 2" O.D. Split spoon 140 lb. hammer 30" drop	
	2	Dark brown silt - (trace fine sand).	4 4 4	1		
	3					
	4	Brown silty very fine sand.				
	5	Brown silty clayey very fine sand.	3 4 6	2		
	6					
	7					
	8	Brown to gray fine to coarse sand and gravel (trace silt and clay) (moist).				
	9		18 26	3		
	10		25			

State Illinois Boring No. B-11

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14	Orange-brown mostly medium to coarse sand and gravel.	11 9 7	4	Damp	
	15					
	16					
	17	Brown to gray fine to coarse sand and gravel.				
	18					
	19					
	20		17 18 15	5		
	21					
	22					
	23					
	24		15 18	6		
	25	Bedrock.	60/5		Trace clay Tri-cone roller bit 25.0'-47.3' No core due to poor rock condition	
	26					
	27					
	28					
	29					
	30					

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State Illinois

Boring No. B-11

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	Bedrock.				
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					
	41					
	42					
	43					
	44					
	45					
	46					
	47					
	48				Bottom of hole 47.3'	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-12

Drilling Firm Warzyn

Type of Drill CME-55

Driller L. Smith

Geologist T. Koch

Start Date 10-5-82

Completion Date 10-6-82

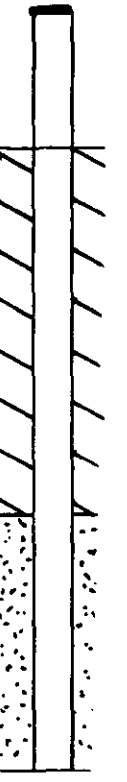
Ground El. 197.71

Groundwater El.
at completion

after 19 days 158.13

Total Depth of Boring 48.9

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
197.71		Ground Surface			T.I.C.=200.00	
	1	Black Silt.			3-1/4" I.D. Hollow Stem Auger. 2" O.D. Split Spoon. 140 lb. hammer 30" drop.	
			4			
	2	Black Clayey Silt.	5	1		
			7			
	3	Brown Silty Clay.				
	4		20			
			25	2		
	5	Weathered bedrock Light brown to gray silty coarse sand & gravel.	35			
	6					
	7					
	8					
	9		19			
			26	3		
			20			



State Illinois Boring No. B-12

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14		14	4		
	15		20			
	16		17			
	17					
	18					
	19	Bedrock.			Tri-cone roller bit with air 18.5 - 20.0	
	20	20.0 - 34.0 Limestone, light gray with tan stain, fine crystalline, slightly to moderately weathered, moderately hard, pitted.			10-5-82 1230 Run #1 20.0-30.2 Diamond Bit, NQ Air Core 10.2/1.6/-8.6 15% Rec. 0% RQD/.14fpm 120RPM/500psi	
	21					
	22					
	23	20.0 - 28.6 lost core				
	24					
	25					
	26					
	27					
	28	28.6 - 29.1 Broken & fractured core gravel size.				
	29					
	30					

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State Illinois Boring No. B-12

Site Acme Solvents Page 3 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
		30.1-30.2 Blue/gray chert nodule			1345	
	31				1400	
		31.05-31.1 Large pitted zone.			Run #2 30.2-37.9	
	32	31.1-31.2 White chert nodule.			7.7/7.5/-0.2	
					97% Rec.	
	33	32.2 Vug.			45% RQD/.09fpm	
		32.45-32.55 Vuggy & pitted zone.				
	34					
		32.6-32.9 Open fracture 75°.				
	35					
		33.0-33.5 Tight vertical				
	36	fractures.				
		33.6-33.9 Small vuggy zone.				
	37					
		33.9-34.85 Open vertical				
	38	fracture.			1520	
		34.0-48.9 Calcareous dolomite,			1610	
	39	lt. gray w/lt. brown stain, fine			Run #3 37.9-48.9	
		crystalline, mod. weathered,			11.0/2.8/-8.2	
	40	pitted with small vugs.			25% Rec.	
		35.7 Vug.			0% RQD/.18fpm	
	41					
		36.0-36.1 Vuggy zone.				
	42	37.7-37.9 Lost core.				
	43	37.9 Large fossil fragment.				
		38.2-38.4 Broken core, gravel				
	44	size.				
		39.5-39.65 Heavily pitted with				
	45	small vugs.				
		40.0-40.7 Broken, fractured core				
	46	gravel size.				
	47	40.7-48.9 Lost core.				
	48					
	49				1710	
	50				Bottom of hole 48.9.	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-13

Drilling Firm Warzyn

Type of Drill CME-55

Driller L. Smith

Geologist T. Koch

Start Date 10-06-82

Completion Date 10-06-82

Ground El. 176.11

Groundwater El.
at completion

after 19 days 153.66

Total Depth of Boring 32.5

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
176.11	0	Ground Surface			T.I.C.=178.99	
	1	Dark brown to black fine sandy silt.	5	1	3-1/4" I.D. Hollow Stem Auger 2" O.D. Split Spoon 140 lb. Hammer 30" Drop	
	2		5			
	3	Brown silty fine sand.	4			
	4		3	2		
	5	Brown silty clayey fine sand (moist).	3			
	6		3			
	7					
	8	Light brown to gray clay (moist)				
	9		3	3		
			4			
			5			

State Illinois

Boring No. B-13

Site Acme Solvents

Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12	Light brown silty very fine sand (moist).				
	13					
	14		6			
			13	4		
	15	Brown to gray silty very fine sand & gravel.	18			
	16					
	17					
	18					
	19		60/0		Tri-cone roller bit with air 18.5-32.5.	
	20	Bedrock.		5		
	21					
	22					
	23					
	24				Encountered water at 23.8.	
	25					
	26					
	27					
	28					
	29					
	30					

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Boring No. B-13

Site Acme Solvents

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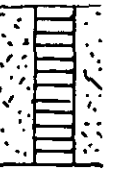
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31					
	32					
	33				Bottom of hole 32.5.	

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DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-14

Drilling Firm Warzyn

Type of Drill CME-55

Driller L. Smith

Geologist T. Koch

Start Date 9-29-82

Completion Date 9-29-82

Ground El. 153.55

Groundwater El.
at completion

after 26 days 150.99

Total Depth of Boring 15.0

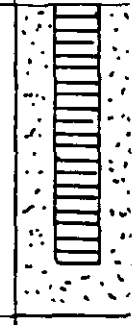
Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
153.55		Ground Surface			T.I.C.=156.55	
	1	Brown fine sand & gravel.			3-1/4" I.D. Hollow Stem Auger 2" O.D. Split Spoon 140 lb. hammer 30" Drop	
	2	Black clayey silt,	3 4 4	1		
	3					
	4	Black silty clay,	3 3 3	2		
	5					
	6					
	7					
	8				Encountered water at 7.5'.	
	9	Light brown fine sand with trace of gravel (wet).	- - 4	3		

State Illinois

Site Acme Solvents

Boring No. B-14

Page 2 of 2

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Brown fine to coarse sand with gravel.				
	12					
	13					
	14		1			
			6	4		
	15		8			
	16				Bottom of hole 15.0.	
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

12/08/82

DRILLING LOG

State Illinois
Site Acme Solvents
Boring No. B-15
Drilling Firm Warzyn
Type of Drill CME-55
Driller L. Smith
Geologist T. Koch

Start Date 10-06-82
Completion Date 10-07-82
Ground El. 181.37
Groundwater El.
at completion
after 18 days 147.14
Total Depth of Boring 40.0

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
181.37		Ground Surface			T.I.C.=184.08	
	1	Gravelly sandy clay (fill).			3-1/4" I.D. Hollow Stem Auger	
	2	Dark brown, clayey fine sand.	8 5 5	1	2" O.D. Split Spoon 140 lb. Hammer 30" Drop	
	3					
	4	Brown silty sand, fine sand with gravel.	5 7 9	2		
	5					
	6					
	7	Light brown silty sand, fine to medium with trace of gravel.				
	8					
	9		8 18 13	3	Fine silty sand interbedded with fine to coarse sand with gravel.	

State Illinois

Boring No. B-15

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11	Same as Sample 3.				
	12					
	13					
	14		25	4	Less silt.	
	15		20			
	16		21			
	17					
	18					
	19		9	5		
	20	Grayish white fine to coarse sand and gravel.	20			
	21	Brown to tan silty fine to coarse sand.	27			
	22					
	23					
	24		23	6		
	25		20			
	26		17			
	27					
	28					
	29		14	7	(wet, trace clay)	
	30		17			
			12			

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State Illinois

Boring No. B-15

Site Acme Solvents

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Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31					
	32					
	33					
	34		18	8		
			19			
	35		21			
	36					
	37					
		Brown medium to coarse sand & gravel.				
	38					
	39					
	40				No sample heaving sand	
					Bottom of hole 40.0.	

12/08/82

DRILLING LOG

State Illinois

Site Acme Solvents

Boring No. B-16

Drilling Firm Warzyn

Type of Drill CME-55

Driller L. Smith

Geologist T. Koch

Start Date 9-13-82

Completion Date 9-15-82

Ground El. 200.24

Groundwater El.
at completion

after 40 days 162.56

Total Depth of Boring 45.4

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
					T.I.C.=202.51	
200.24	0	Ground Surface				
	1	Reddish brown silt with trace fine sand.			3-1/4" I.D. Hollow Stem Auger	
	2		4 3 2	1	2" O.D. Split Spoon 140 lb. Hammer 30" Drop	
	3					
	4	Brown medium to coarse sand and gravel.	6 7	2		
	5		10			
	6					
	7					
	8					
	9		34 43/5	3	Seam of light brown medium to coarse sand and gravel 9.0-9.5.	

State Illinois Boring No. B-16

Site Acme Solvents Page 2 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	11					
	12					
	13					
	14		100/5	4		
	15					
	16					
	17					
	18				Auger refusal	
	19		60/1	5	@ 20.0	
	20					
	21				Tri-cone roller bit with air 20.0-22.0	
	22					
	23	22.0-45.4 Calcareous dolomite, tan, very fine, crystalline, moderately to highly weathered, moderately hard to soft, pitted with vugs, some fractures.			9-14-82 0850 Run #1 22.0-32.0 Diamond bit, NQ Air core 10.0/5.0/-5.0 50% Rec. 19% RQD/.22fpm 90 RPM/450psi	
	24					
	25					
	26					
	27	Lost core 22.0-27.0.				
	28	27.6-28.25 Heavily pitted. 28.5-28.8 Broken core, gravel size.				
	29	29.2-29.8 Open fractures, generally vertical.				
	30	29.7-30.1 Vug zone.				

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State Illinois Boring No. B-16

Site Acme Solvents Page 3 of 3

Elev.	Depth	Description	Blow Count	Sample No.	Remarks	Well Const.
	31	30.1-30.5 Open fractures, generally vertical. 31.0-31.5 Heavily pitted.				
	32				0940	
		31.4-31.7 Open fracture zone.			Run #2 1025	
	33	31.7-32.0 Broken core, gravel size.			32.0-36.5	
					4.5/0.5/-4.0 1035	
	34	32.0-36.0 Lost core.			11% Rec	
					0% RQD/.09fpm 1045	
	35					
					1100	
	36	36.0-36.5 Broken core, gravel size.				
					1425	
	37	36.5-42.9 Lost core.				
					1450	
	38				No sample	
					9-15-82 1330	
	39				Run #3 37.4-45.4	
					8.0/2.5/-5.5	
	40				35% Rec.	
					0% RQD/.106 fpm	
	41				Encountered water	
					at 39.0.	
	42					
		42.9-43.8 Heavily pitted with				
	43	numerous tight fractures.				
	44	43.8-45.0 Broken & fractured core, gravel size & generally				
	45	vertically fracture.				
	46				Bottom of hole 45.4.	

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